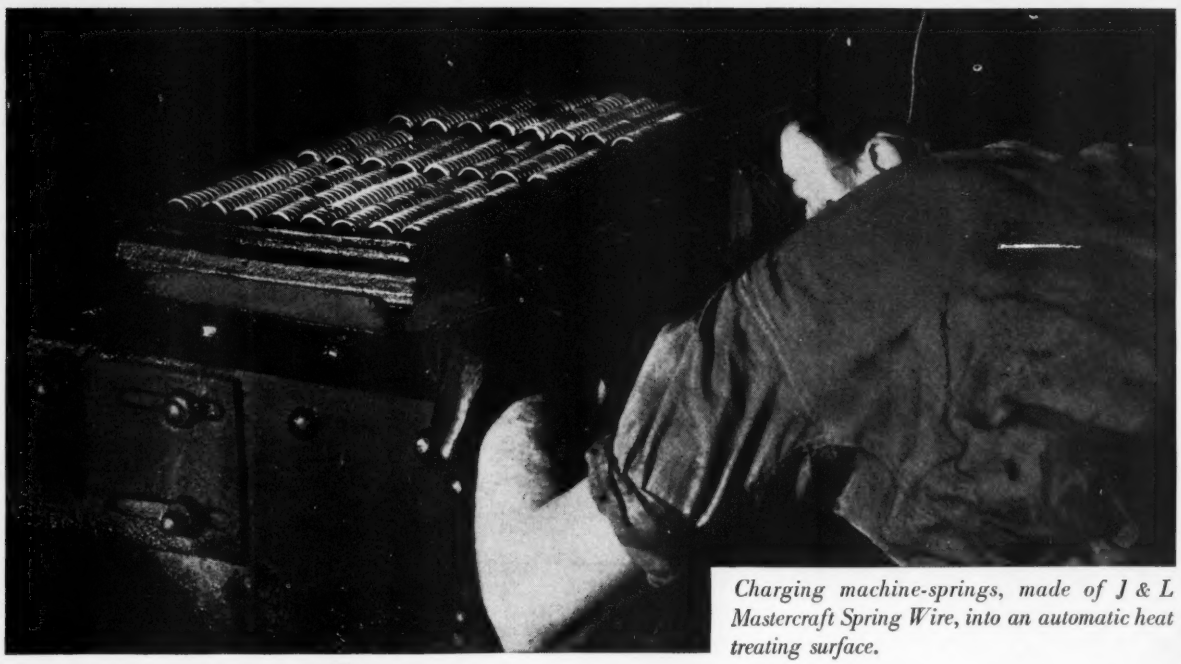
FEBRUARY 1940

WIRE AND WIRE PRODUCTS



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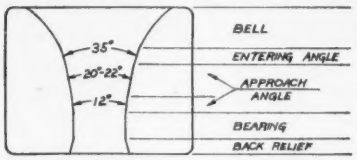

and then you will have a 20 to 22-degree angle for a height of at least $\frac{1}{8}$", and in front of that, a 35-degree entering angle. The rings almost invariably form at the line where the entering material strikes the approach angle, and when the entering material strikes in the 22-degree angle, it is worked a little faster, and the ring takes a wide, shallow form which polishes, and causes little or no trouble. The shape which causes this form of ring to form, will give greater production per hole size.

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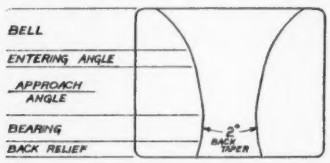

back taper on the bearing which keeps the swelling wire from dragging in the bearing. It is always advisable to put the bearing in from the back, even with a straight lap, and in doing so, we have a slight back taper, but on extremely hard materials a little increase in the back taper sometimes helps a great deal.

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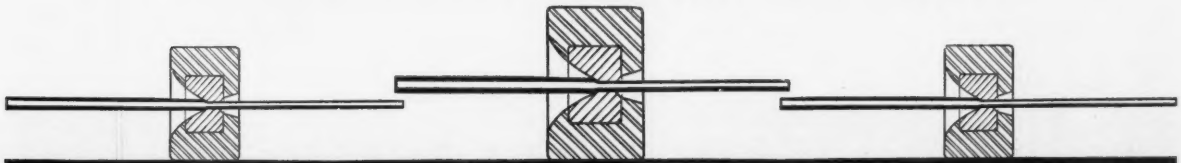

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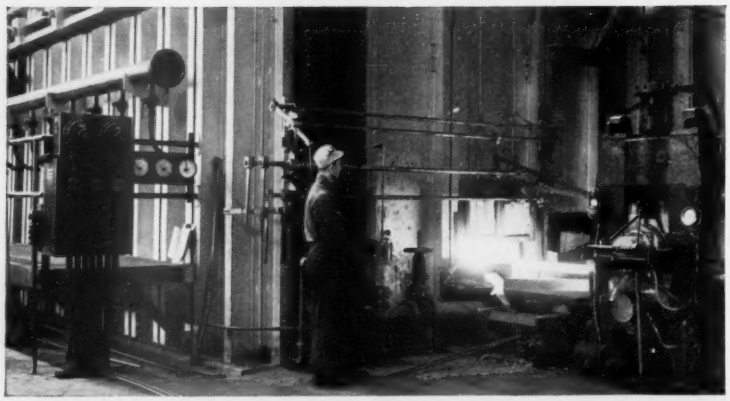

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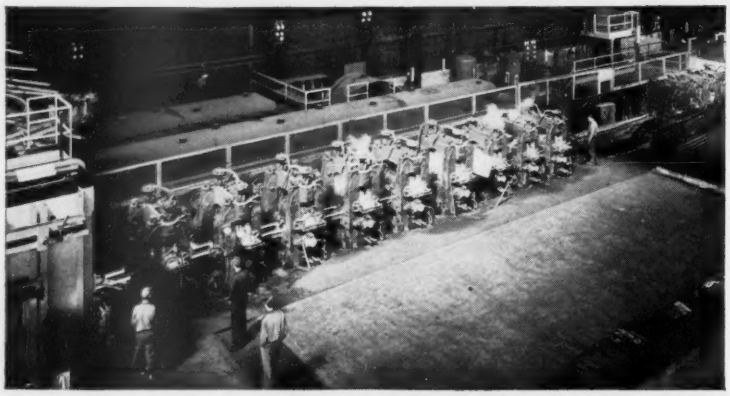

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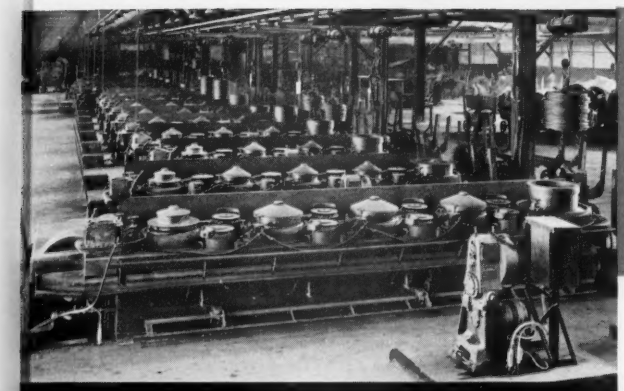

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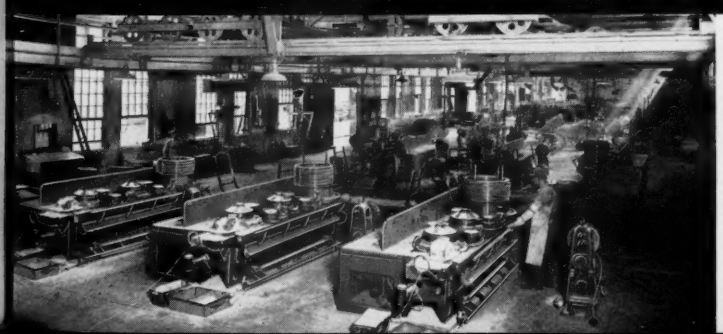

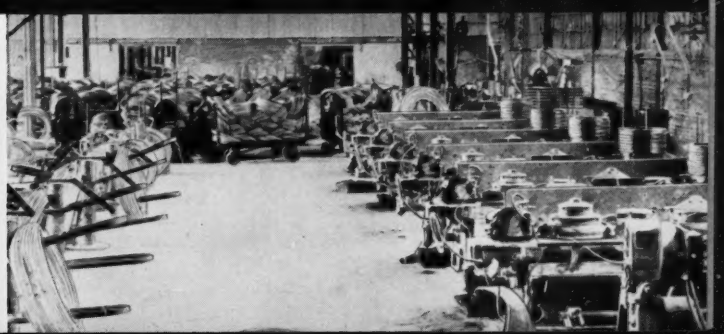

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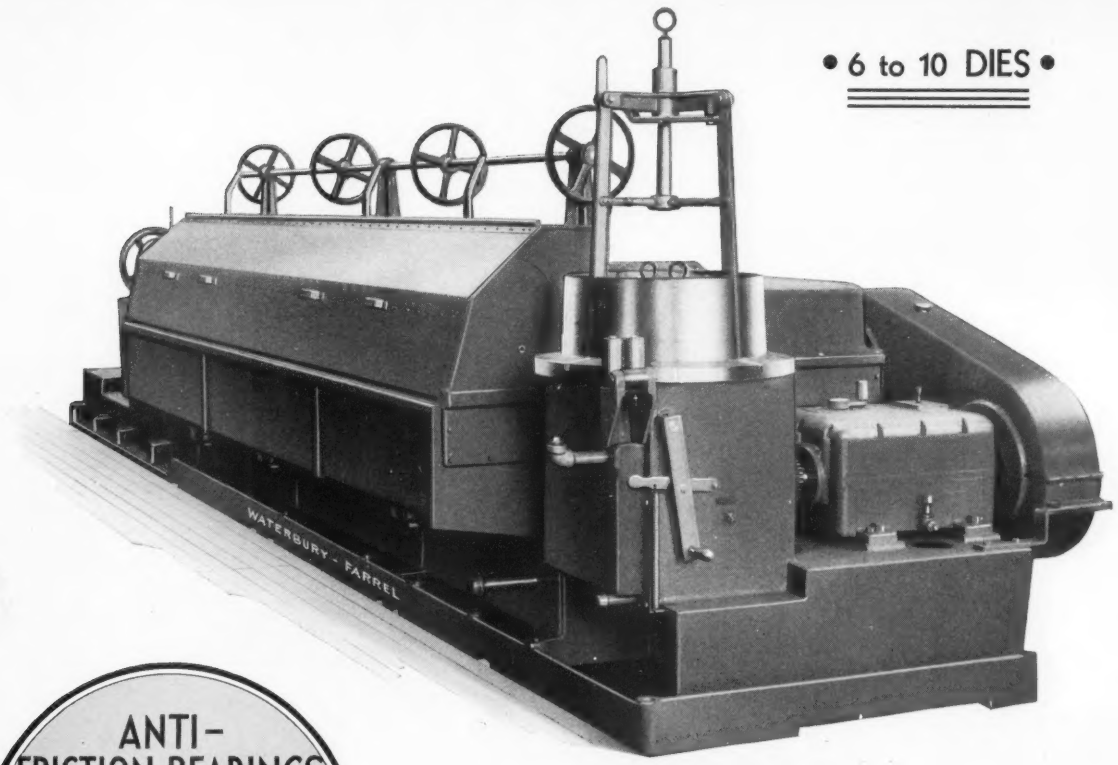

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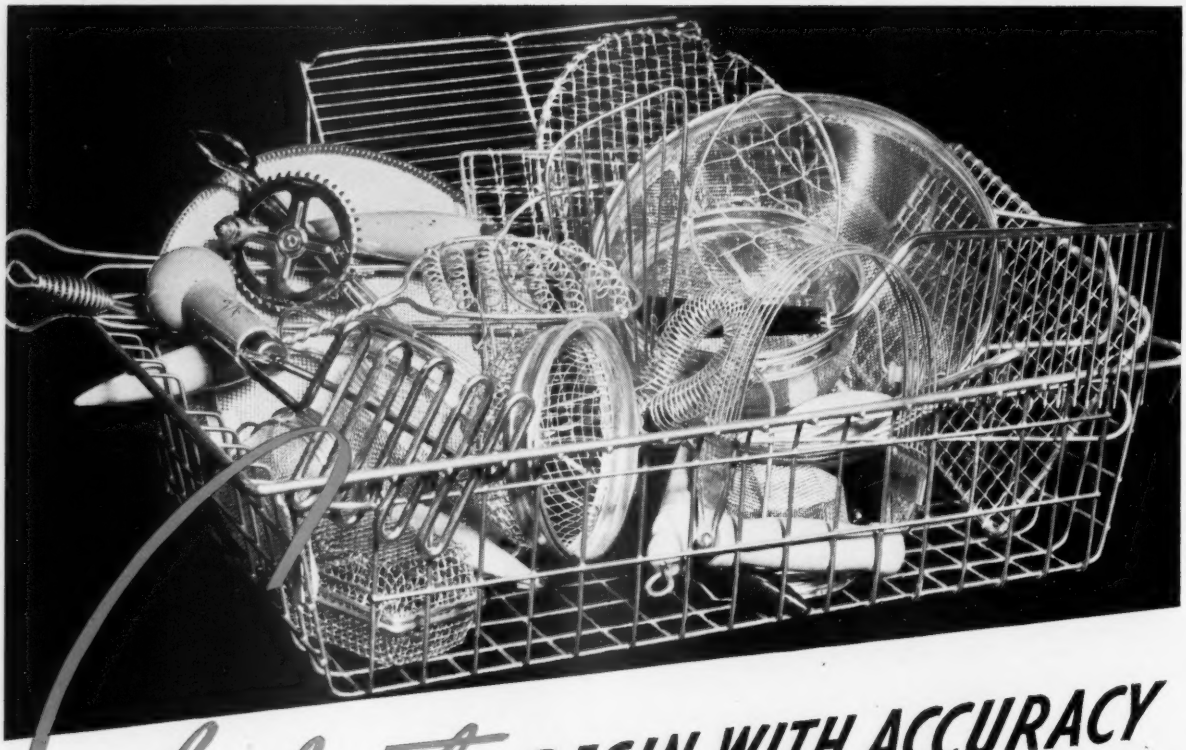

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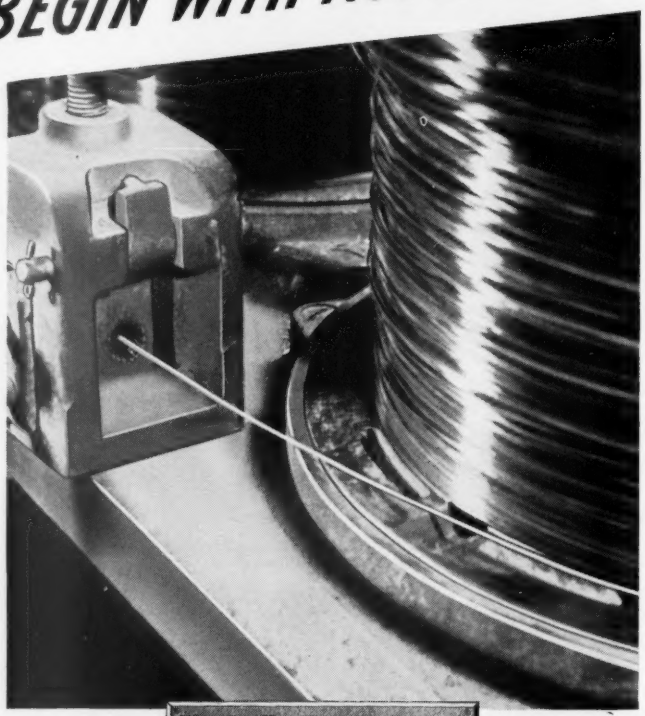

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A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 15 FEBRUARY, 1940 No. 2

Designated as

Official Publication By The Wire Association

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Publication Office: Washington, N. J.

Executive Office: Stamford Trust Co. Bldg., 300 Main St., Stamford, Conn.

Annual Subscription, U. S. $5.00, Canada $5.00

50 Cents a Copy in U. S. Issued Monthly Foreign, $7.50

October Convention Issue $1.00 a Copy

January Convention Discussions Issue $1.00 a Copy

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WIRE & WIRE PRODUCTS, Vol. 15, No. 2, February, 1940, Executive Office, 300 Main St., Stamford, Conn. Published by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secretary and Treasurer. Publication office, 13 West Church Street, Washington, N. J. Subscription price: U. S., $5.00; Canada, $5.00 per year, 50 cents per copy; Foreign, $7.50 per year. Entered as second class mail at the Post Office, Washington, N. J., under Act of March, 1879.

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DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 15 FEBRUARY, 1940 No. 2

A Brief Resumé of Special Cold Heading Wire Requirements

By A. M. Reeder,
Metallurgical Engineer,
Jones & Laughlin Steel Corporation, Pittsburgh, Pennsylvania

A brief discussion of the recent major developments in cold heading with the primary idea of emphasizing the quality of wire and rod product requirements rather than mechanical features of the operations involved. ✦ ✦ ✦ ✦ ✦

THERE are numerous processes for the cold deformation of metals, but in so far as the wire producer is concerned, the one process which more often tests the metal beyond its capacity for cold work, is the cold heading or cold upsetting process. Recent papers on this subject have referred to the revolutionary changes in the art of cold heading, which until a decade ago was confined primarily to the production of commercial bolts and screws for the hardware and machinery industries. Today its sphere of activity is broadened to include the manufacture of many important items which have heretofore been confined to the hot forging, machine screw and nut industries.

✦ ✦ ✦

THE rapid progress of this industry is by no means accidental but finds its stimulus to a large measure in the fact that improved physical properties are coincidental with favorable production costs. We will not attempt to elucidate on this point further except as it affects the demand for special quality requirements of cold heading wire and wire rods. The rapid changes taking place in methods and machines for cold heading have necessitated far more attention to quality details than heretofore. Close cooperation between the wire producers and the cold heading people is absolutely essential if such quality details are to be met with least expense to all concerned. Fortunately the value of such cooperation appears to be well recognized and accounts in no small measure to the early solution of many of the new and difficult jobs which are being attempted in the cold heading field.

A. M. REEDER

Graduated from Purdue University in 1920 with a degree in Chemical Engineering. Associated with the Metallurgical Department at Gary Works, Carnegie-Illinois Steel Corporation 1921-1927. Since that date has been in the employ of the Jones & Laughlin Steel Corporation, first as Chief Inspector of the Wire Division, then Assistant Metallurgist of their Aliquippa Works, and since 1934 as Metallurgical Engineer on wire and rod products.

✦ ✦ ✦

MORE recently, the heading industry has been making some progress towards the utilization of rods as a substitute for wire. Several methods have been developed but all substantially are a means to the same end, that of reducing either the hot rolled or

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the heat treated rod to the necessary round section and at the same time obtaining the surface finish required for cold heading. Since in most of these developments the operation is performed as an integral part of the heading cycle, somewhat more care must be taken in supplying suitable rod stock than is necessary in producing satisfactory wire.

✦ ✦ ✦

THESE examples of change in the cold heading field, which are motivated by a desire to effect economy as well as to broaden its scope of activity, are a continual challenge to the rod and wire manufacturers to furnish a suitable raw material for each new development. This point has particular significance when we consider that the change is not only toward a higher production of headed parts, but a superior quality of finished product. The recent major developments in cold heading are discussed here briefly with the primary idea of emphasizing the quality of wire and rod product required rather than mechanical features of the operations involved.

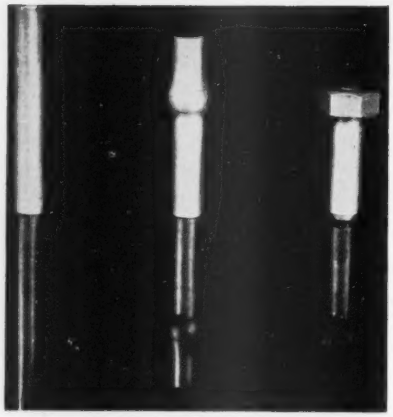
✦ ✦ ✦

Single and Double Extruding in Heading

THE process of extruding in the header die during the upsetting operation is one of the most interesting as well as commercially important developments of the heading industry in recent years. Previous to the introduction of extrusion heading, the general practice was to extrude after the standard two blow heading operation was completed.

✦ ✦ ✦

FIGURE 1 shows the steps in the production of the double blow headed blank where no extrusion was performed in the header die. If this blank is to be finished to a standard cap-screw, that part of the shank to be roll threaded is extruded; that is, reduced in diameter some .030″ to .060″ in a subsequent operation by forcing the shank into an extruding die. This is usually accomplished simultaneously with the trimming operation.

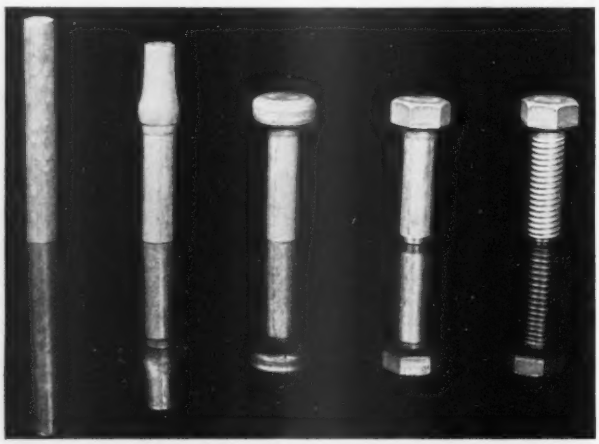


A. B. C.

Fig. 1. (Shadowgraph) Standard Upset — No Extrusion. A. Blank. B. First Blow. C. After Heading, Trimming and Pointing. ✦ ✦

✦ ✦ ✦

FIGURE 2 shows the stages of production of the standard cap screw, incorporating a single extrusion in the header die. The wire finish in this case, as in the case of extrusion after heading, must be uniform and of a lubricating quality which will withstand the pressure and temperature of the involved operations. The combination of extrusion and heading operations in the same die calls for special care in the wire drawing operation in order that the finish will be of such a character as to properly adhere without clogging the corners of the die, and at the same time afford sufficient lubrication so that the upset blank may be ejected without sticking and scoring, or breakage of the ejector pin.



A. B. C. D. E.

Fig. 2. (Shadowgraph). Single extrusion in cold heading. A. Wire blank. B. First blow, showing extruded shank. C. Second blow. D. After trimming and pointing. E. After roll threading. ✦ ✦ ✦

✦ ✦ ✦

A GREAT deal of investigational work has been done by the cold heading wire manufacturers to produce the type of finish required for all types of extruding in heading. Factors which have contributed most to obtain the required finish are: Carefully controlled cleaning practices, quality of lime, practice of liming and baking and quality of drawing lubricant. Each of these factors must be given special attention if the highest type of finish is to be obtained. It might be mentioned in this connection, for example, that the flash baker has been found particularly adaptable to obtaining a very adherent lime coating. A light to medium sulcoat is often applied but must adhere very tenaciously to the wire during the extrusion operations or danger of clogging in the dies may be too great.

✦ ✦ ✦

FIGURE 3 depicts the several stages in double extrusion which are generally performed on drawn wire but may also be accomplished from rod stock which has been properly cleaned and lime coated. Incidentally, in this case the operations were performed in the bolt maker and the stages after trimming, pointing and roll threading are also shown.

✦ ✦ ✦

IT can be readily understood that rods for double extrusion must be especially round and close to size. Oversize rods might fail to enter the die opening, under size and out of round stock might be difficult to fill out properly in the die. A somewhat pitted or other-

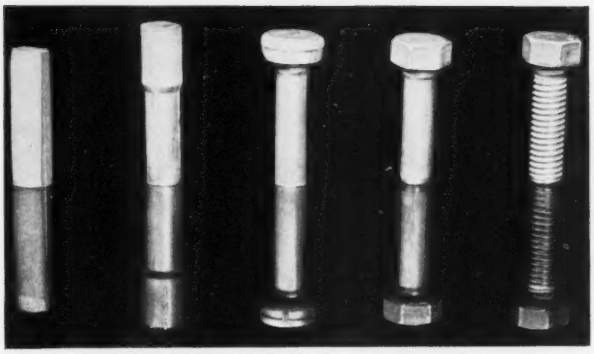
wise rough surface is likely to scratch and gall in the extruding die. Die wear in any case is likely to be considerably more rapid than when wire is used.

✦ ✦ ✦

THE regular grades of steel from S.A.E. 1010 to S.A.E. 1040 will generally extrude without difficulty if the wire finish is of the proper quality and the mechanical setup is correct. Heat-treatments such as normalizing or spheroidizing, as applied to the rod, are definitely beneficial in improving the plastic quality for cold upsetting and will also increase the extruding properties of the metal. This is particularly true of the higher carbon, cold heading grades and is always recommended where more than the ordinary upset is required of the metal. Due to the extra cost involved for normalized or spheroidized stock, the bolt manufacturer is often tempted to use the untreated material even for the more difficult cold heading jobs. Such practice too often results in forcing the metal beyond its plastic limit and splitting occurs usually in the longitudinal direction.

✦ ✦ ✦

FIGURE 4 shows a few of the more difficult types of cold headed and roll threaded parts which may be most successfully formed from processed or normalized stock. Surface defects such as superficial seams and laps and even fine scratches may act as nuclei for splitting during upsetting; consequently the steel maker has set up special practices for steel making, heating and rolling to keep such defects to the very minimum. Often, however, splitting occurs where no surface defect is present, indicating definitely only plastic failure involved.



A. B. C. D. E.

Fig. 3. (Shadowgraph). Double Extrusion in Heading. A. Wire or rod blank. B. First extrusion. C. Second extrusion. D. After trimming and pointing. E. After roll threading. ✦ ✦ ✦ ✦

IT is almost universal practice to make an inspection test of a practical nature on every bundle of cold heading rods or wire before shipment. This may be in the nature of a forward and reverse twist test to reveal surface defects, a surface etch test or an upsetting test. In spite of these precautions, cold heading complaints have been rather numerous, primarily on the higher carbon grades, pointing to the necessity for a greater degree of plasticity, best attainable through normalizing, annealing or spheroidizing.

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MEASUREMENT of plasticity can be ascertained to some degree by hardness and tensile tests. A metallographic structure consisting of large ferrite grains appears to give greatest possibility for plastic flow. A coarse grained normalized or spheroidized structure meets such a requirement far better than the regular hot rolled structure.

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A DROP testing mechanism (see Figure 5) has been devised for comparing the "plasticity" of various grades of steel and effects of heat treatment and drafting practice. A 400-pound cylindrical steel weight is dropped vertically an exact known distance upon a slug of cold heading stock. The height of the slug used in our tests was the same as the diameter of the stock. A so-called "plasticity" factor was computed by multiplying the loss in height of the slug by the average area upon which the drop hammer acted. While the results of our tests are still quite incomplete, the following general conclusions seem fairly evident:

A—Plastic flow of the wire as drawn from hot rolled rods is in a general way, inversely proportional to its hardness.

B—The "plasticity" of normalized or spheroidized wire appears to be considerably greater than the same material in the unnormalized or unspheroidized condition but of equivalent hardness.

C—Rimmed steel shows a definitely greater "plasticity" than killed steel of the same chemical analysis.

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DATA is also being accumulated in an effort to measure the effect of aging on the plastic quality of various cold heading grades. A very interesting observation of this test was the marked effect of a lubricant at the point of contact of the hammer and the slug in increasing the effectiveness of the blow by reducing friction.

✦ ✦ ✦

Free Machining Cold Heading Steels

WHEN the steel manufacturer is requested to furnish a free machining steel which must also withstand a considerable amount of cold upsetting, it is necessary to digress

Fig. 4. Illustrating various shapes of difficult cold headed parts. Most of these parts were extruded during heading and will be roll threaded. The lag screw in center of photograph illustrates one of the most drastic types of roll threading jobs. ✦ ✦ ✦ ✦

from the practice and analysis adhered to where only one of these characteristics is of chief consideration. Unfortunately, those properties which are conducive to free machining may be expected to adversely affect plastic properties, thus causing premature rupture when the metal is to be subjected to cold upsetting. Consequently, it is necessary to obtain a fine balance of these properties and at the same time maintain a surface sufficiently free from imperfections to meet all requirements.

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SINCE some added sulphur is generally required to obtain the necessary free machining quality, the problem of keeping seams and slivers to a minimum is a very real and often costly one. The added sulphur, to be of beneficial effect in machining operations, should usually be in excess of .07 percent, which unfortunately is very apt to cause a red short condition of the surface, that is, a surface which tears and ruptures very easily during hot rolling in the various stages from the ingot to rod. Special rolling and heating practices as well as costly chipping and inspection standards must be applied in the production of this type of product. A normalizing treatment applied to the rod before drawing is well worth the extra, in improving both the heading and free machining characteristics.

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ONE of the important current applications of the heading machining steels is in the manufacture of nuts by the cold heading process in Figure 6 is shown the successive stages during cold heading from wire to nut blank ready for tapping. Very minute surface defects are likely to act as nuclei for splitting at the corners of the nut. While these have little or no effect in weakening the nut, their appearance is objectionable and generally not tolerated by the consumer.

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THE application of cold heading steels to the production of

Fig. 5. Photograph of drop test machine for testing "plastic" upsetting quality of cold heading steel.

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wood screws has received far more attention during the past few years than heretofore. In addition to the demand for free machining quality, since wood screws are almost invariably cut thread, the steel producer has been asked to furnish material with greater torque strength. At the same time, certain radical changes in head design have been introduced, most of which demand more in the way of plastic quality than the common slotted wood or machine screw.

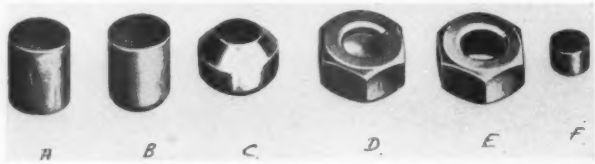

Fig. 6. Various stages in the manufacture of a Standard Hexagon Nut from cold heading wire. A. Wire Blank. B. After pointing and square up. C. After coning. D. After forming and recessing. E. After punching. F. Slug.

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Fig. 7. Different views of special type, fillister head machine screw blank.

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FIGURE 7 depicts one special type of the recent special designs which are slotted in the heading operation.

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THE demand for greater torque strength has led to considerable investigational effort on the part of both the wire and screw manufacturers to satisfy this requirement. Testing equipment has been devised for measuring torque strength of both the wire and finished screws. Various combinations of analyses, drafting practices and heat treatments are being investigated and considerable progress has been made toward the production of higher torque properties and at the same time retaining necessary heading and machining characteristics.

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IT is not necessarily true that wire which shows excellent torque properties will invariably produce a screw with similar torque values. The design of the screw and the technique in its manufacture are factors which may often govern the driving strength to a greater degree than the physical properties of the wire from which the screw is produced.

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SEVERAL types of screws such as the sheet metal and self-tapping types, are generally subjected to various heat-treatments during their manufacture. It can be expected that both torque strength and surface hardness will depend to a large measure on the results of this heat treatment.

(*Please turn to Page 130*)

Types of Stainless Steel Manufactured In Germany Pending Shortage of Nickel

Data relating to metallurgical progress in stainless steel in Germany which has occurred as a result of the shortage of nickel together with the necessity for saving high grade metals. ✦ ✦ ✦ ✦ ✦

GERMAN industry has learned to make extensive use of existing metals in the manufacture of high grade steel in view of the shortage of certain raw materials, including such metals as chromium and molybdenum. Great economy is exercised in the consumption of nickel. This necessity applies naturally also to the manufacture of apparatus for the chemical industries, for which chromium-nickel steel was formerly predominant. The shortage of nickel has turned the attention of manufacturers to chromium steel (16 to 18 per cent Cr), chromium-molybdenum steel (18 per cent Cr, 2 per cent Mo) and chromium-manganese steel (8-18 per cent Mn. 18-10 per cent Cr). Chromium-silicium steel (2.5 per cent Si and 2.5 - 7 per cent Cr) is principally used in the construction of furnace parts.

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FOR the purpose of saving high grade metals, processes have also been developed which permit the combination of a thin layer of stainless steel with iron in such a way that a uniform material is the final product. The use of stainless steel in the construction of apparatus for the chemical industry and in the manufacture of furnaces, necessitates welding steel without detriment to its mechanical and chemical qualities. The problem of making steel which can be welded is therefore of cardinal importance. While highly-alloyed chromium-nickel steel fully meets this demand, special processes are necessary to make nickel-free steel properly weldable.

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BY heating the above mentioned chromium and chromium-molybdenum steel (acid - proof steel) and the chromium-silicium steel (scale-proof steel) to a temperature of more than 1,000 degrees centigrade for a considerable length of time, the grain of these steels will become coarse and the steel itself brittle, to a greater or lesser degree. In the process of welding this limit of temperature is exceeded at the seam and closely above the seam. Therefore care has been taken to cause the heat to have as short an effect as possible during the welding process. Electric welding is preferable, since it does not cause such an enlargement of the grain near the seam as is brought about by gas welding. Another method of preventing an enlargement of the grain is the addition of niobium, tantalium and titanium to the steel. Besides preventing the enlargement of the grain, these elements act against a diminution of chemical consistency of the zone which is heated during the welding process by preventing the so-called disintegration of grain and the so-called intercrystalline corrosion. If these types of steel are employed in their proper fields and if they are properly treated, welding will not have an adverse effect on their chemical and mechanical qualities. These types of steel can therefore often be used to replace the standard types of chromium-nickel and chromium-nickel-molybdenum steel.

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TABLE No. 1 contains the analyses of nickel-free stainless types of steel. Types No. 2 and 4 are specially suitable for welding. Steel No. 5 is a type of chromium-molybdenum steel which may be tempered to varying degrees of hardness. It has highly satisfactory chemical qualities, and its ductability (Laufeigenschaften) is greater than that of the highly alloyed chromium-nickel steel. It also has a high tensile stress so that is may be used in the manufacture of machine knives for cutting cellulose and paper. Steel No. 6, if hardened, is particularly suitable for cutting tools. Table No. II shows the various types of chromium-manganese steel. Steel No. 3 is a substitute for the standard 18/8 chromium-nickel steel in which nickel has been replaced by manganese. This gives this steel a structure which for its greater part is austenite, and this steel may therefore be placed about on a level with chromium-nickel steel as far as mechanical qualities are concerned. With regard to chemi-

cal qualities, however, this type of chromium-manganese steel is comparable only with chromium steel having the same chromium content. For this reason the field of employment of chromium-manganese steel is limited. It is frequently used in the manufacture of equipment for dairies and creameries. It is also used where formerly copper, brass or tin-plated parts were employed, such as filters for artesian springs. In order to permit of a greater chemical stress, niobium, tantalium and titanium are added to the types of chromium-manganese steel.

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IN the manufacture of scale-proof silicium - manganese - chromium steel No. 3 special importance was given the problem of obtaining a completely austenite structure. This was necessary in view of the fact that if there is still ferrite contained in chromium-manganese steel, the ferrite is decomposed in the case of the steel being heated to a temperature between 700 and 750 degrees centigrade for a considerable length of time. This phenomenon leads to a considerable diminution of the steel's mechanical qualities. The resistance to scaling which may be offered by manganese-silicium-chromium steel, which may be heated up to a temperature of 950 degrees centigrade, is first of all determined by the chromium content, the favorable influence of which is supported by the addition of silicium. If the chromium content is increased by eliminating silicium, ferrite will appear in the case of a chromium content of more than 15 per cent. Manganese-silicium-chromium steel, according to type No. 3 in table No. II, offers resistance to heat at 750 degrees centigrade which resistance is considerably higher than that displayed by 25/20 chromium-nickel steel.

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STEEL is plated on iron generally in a layer comprising ten per cent of the total thickness of the material. However, the plating may be thicker or thinner if necessary, the minimum being twenty-five millimeters. Manufacturers of chemical apparatus are enabled by this material to base types and durability of the apparatus on the well-known qualities of malleable iron. Care has to be taken that only the rolled-on stainless steel is exposed to acids, lyes, etcetera.

✦ ✦ ✦

(Extracts from and summary of lecture delivered by Dr. Hans Hongardy at the "Haus der Technik", Essen.)

Source: "Technische Blatter of the Deutsche Bergwerks-Zeitung, No. 4, January 23, 1938.

TABLE No. I

Analyses of Stainless Cr-, CrMo- and CrSi-Steel

TYPE OF STEEL	C per cent	Si per cent	Cr per cent	Mo per cent	Other elements	Conditions	Remarks
Acid-proof steel:							
1. Chromium steel	0.10	0.50	17	—	—	heated	—
2. Chromium steel	0.10	0.50	17	—	Nb, Ta, Ti	heated	weldable quality
3. Chromium-Molybdenum steel	0.10	0.50	18	1.8	—	heated	—
4. Chromium-Molybdenum steel	0.10	0.50	18	1.8	Nb, Ta, Ti	heated	weldable quality
5. Chromium-Molybdenum steel	0.40	0.50	18	1.5	—	tempered	—
6. Chromium-Molybdenum steel	0.90	0.50	18	1.2	—	hardened	—
Scale-proof steel:							
1. Chromium-Silicium steel	0.10	2.5	2.5	0.50	Nb, Ta, Ti	heated	scale-proof up to 800 degrees centigrade
2. Chromium-Silicium steel	0.10	2.5	6.5	—	Nb, Ta, Ti	heated	scale-proof up to 950 degrees centigrade

TABLE No. II

Analyses of Stainless Chromium-Manganese Steel

TYPE OF STEEL	C per cent	M per cent	Si per cent	Cr per cent	Ni per cent	Other elements	Remarks
1. Manganese-Chromium steel	0.10	18	—	10	1	—	acid-proof
2. Chromium-Manganese steel	0.10	8	—	16-18	1-2	if necessary Nb, Ta, Ti	
3. Manganese-Silicium-Chromium steel	0.10	18	4.0	10	—	Nb, Ta, Ti	scale-proof up to 950 degrees centigrade

Better Wire from Wickwire Brothers

By Chester F. Wickwire, Vice President, Wickwire Brothers, Inc., Cortland, N. Y.

and

J. L. Whitten, Sales Manager, Lee Wilson Engineering Co., Cleveland, Ohio

Central New York manufacturer rebuilds annealing department with bell type furnaces.

THE wire, screen cloth and netting plant of Wickwire Brothers, Inc., at Cortland, N. Y., is unique in its location, completeness of operations, and control of its quality from open hearth to woven product.

✦ ✦ ✦

DEVELOPING originally from a small weaving plant started by two hardware merchants, the Wickwire Brothers, progressively the company has grown to include wire drawing, rod rolling, and steel making, and at the same time the product of the plant has broadened out to all kinds of industrial wire cloth, nettings, and commercial low carbon wire.

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THE foresight of the founders, together with their mechanical and commercial ability, has been ably continued in the leadership of Charles C. Wickwire, for many years president of the company and the developer of many of the intricate welding and weaving processes used in producing the various types of nettings and cloth. The company has operated conservatively, but has made steady improvements in equipment and processes when they offered sufficient improvement in product to warrant their adoption.

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IN line with this policy, a decision was made about a year ago to improve the annealing of wire, and after a period of investigation, a contract was placed with the Lee Wilson Engineering Company of Cleveland for two circular bell type furnaces, complete with six bases and gas atmosphere equipment for bright annealing, and construction started.

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SEVERAL months later the installation was completed and appears as shown in Fig. #1. The low head room of the crane required a pit to be dug to provide adequate height from floor to crane hook, in this case 10 ft. 0 in. below the loading floor. Since this level was lower than drainage point, the pit was provided with a sump and pump to keep it dry in rainy seasons.

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INSTALLING the furnaces in a deep pit had advantages from a loading standpoint, as a platform was installed at one end of the pit to support the loading spindles or spiders at a level which placed their top approximately 12 in. above the floor and in an easy position for loading the coils from buggies. Two operators lift the coils rapidly and drop them on the spiders. When filled, the spider can be lifted slightly and moved to the empty base. To avoid moving the loaded spiders six such loading positions extend along one end of the pit.

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THE first two furnaces purchased were bought for 24 in. wire coils only and to eliminate muffle annealing of this size. The furnace size was 30 in. diameter by 84 in. loading height and charges of approximately 4800# could be made of 24 in. coils. Of course, various other size coils were annealed for trial, but these first two furnaces were purchased for a special duty to which they were especially adapted. These furnaces were fired with ten Wilson vertical radiant tubes, using high pressure natural gas as fuel. Each furnace has three bases and each base has its own high-speed recirculating fan. Sand seals are used.

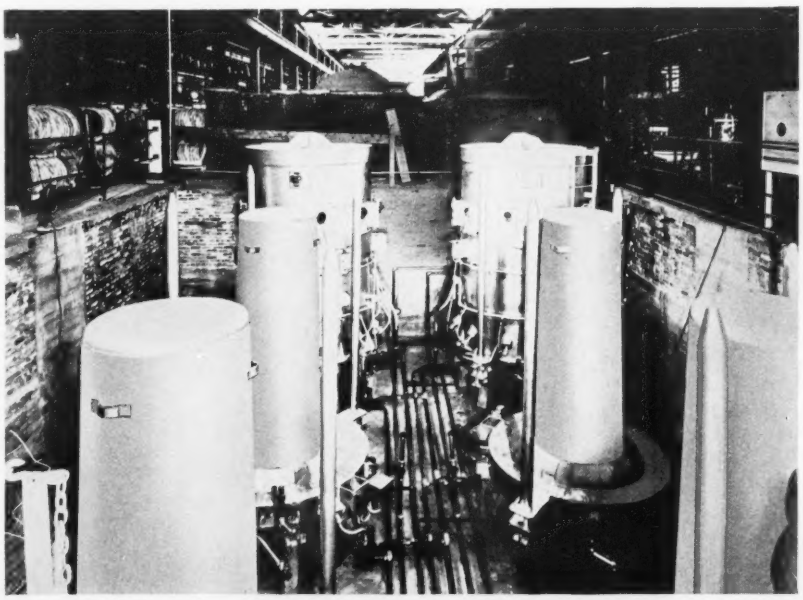

Fig. 1. First Two Furnaces Installed.

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FIG. #2 shows the temperature control board and deoxidizing gas generating equipment in place. The temp-

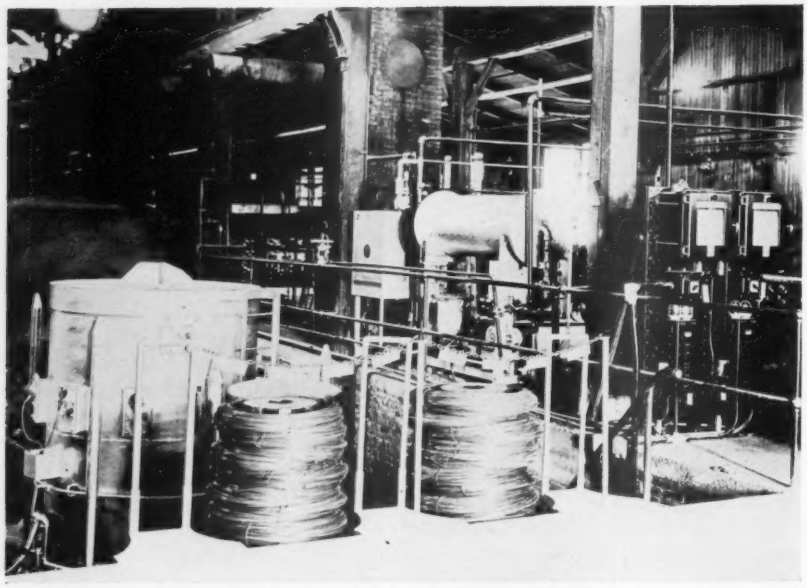

Fig. 2. Temperature Control Board and Deoxidizing Gas Generating Equipment.

erature controller is a three-point instrument which records the temperature at the top of the charge, at the bottom of the charge, and at the firing tubes. The top of the charge is the control point. Only one control valve is required per furnace and this is of the modulating type. Any cooling base can be recorded on the instrument by turning the small switch mounted below the recorder. Failure of gas pressure or power, or excessive temperature on the tubes will cause complete shut-off of the fuel. Restoration of these conditions to normal will not turn the fuel on again until the ignition system is turned on at the master control panel (the box with the two lamps) which is mounted at the panel.

Wire Coil Size	Number of Stems	Weight/Stem	Total Charge
24 in. — 22 in.	1	4,800#	4,800#
16 in.	3	2,610#	7,830#
12 in.	5	1,430#	7,150#
16 in.	2	2,610#	5,220#) 8,080#
12 in.	2	1,430#	2,860#)
8 in.	8	625#	5,000#

Fig. 3. Completed Installation of Four Furnaces and Twelve Bases.

THE deoxidizing apparatus consists of a 1,000 cfh. natural gas combuster with a refrigerator of the same capacity. This machine was later almost doubled in capacity to accommodate two new furnace units. This was done by increasing the air pump speed and by installing a second gas cooler after the combuster to remove most of the water of combustion from the gas. A deep well was drilled in the bottom of the pit to obtain very cold water for the gas coolers. This arrangement practically eliminates the necessity of the refrigerator except in very warm weather. A gas temperature of about 60 deg. F. can be obtained without refrigeration.

THESE first two furnace units and six bases have been in continuous operation since June 1, 1939, running seven days per week and twenty-four hours per day. They have not been shut down for any reason and produce one hundred twenty-five tons of annealed wire every week. The wire, after annealing, is entirely scale free and bright in accordance with the amount of soap left on from drawing. It is not necessary to pickle any of this wire for many uses. In most cases it can be redrawn after liming and baking with no cleaning necessary. In finished wire sizes the wire is sent directly from the furnaces to the weaving machines or to be shipped.

THE operation of these units was so successful that after six weeks' observation of their performance, two additional units were ordered for annealing 16 in., 12 in., and 8 in. block coils. The second units ordered were made larger in size, 42 in. diameter, with the same loading height. This size provided for a very much larger load, as much as 8,080# of wire being placed at one time on the base. The following table illustrates the various loads which can be placed on these 42 in. bases:

THE installation of the third and fourth furnaces with six more bases required tearing out about half of the old annealing pot settings. This was done while the furnaces were being fabricated and the installation completed in two months' time. The gas apparatus was increased in capacity and a wire loading and stripping machine added at this time. Fig. #3 shows the completed installation of all four furnaces. Stairways are located at either end of the pit and the second panelboard shown in Fig. #4 was placed at the upper end, adjacent to the two new furnaces. All four control valves, with safety valve and pressure switch were located together as shown in Fig. #4.

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THE 42 in. furnaces were equipped with 7500 cfm. fans, and, as might be expected, the tonnages were increased sharply, each of the 42 in. furnaces annealing 82 tons of wire in seven days. The same surface results were obtained in brightness, the liquor-finish wire coming out with a mirror finish of polished chromium appearance.

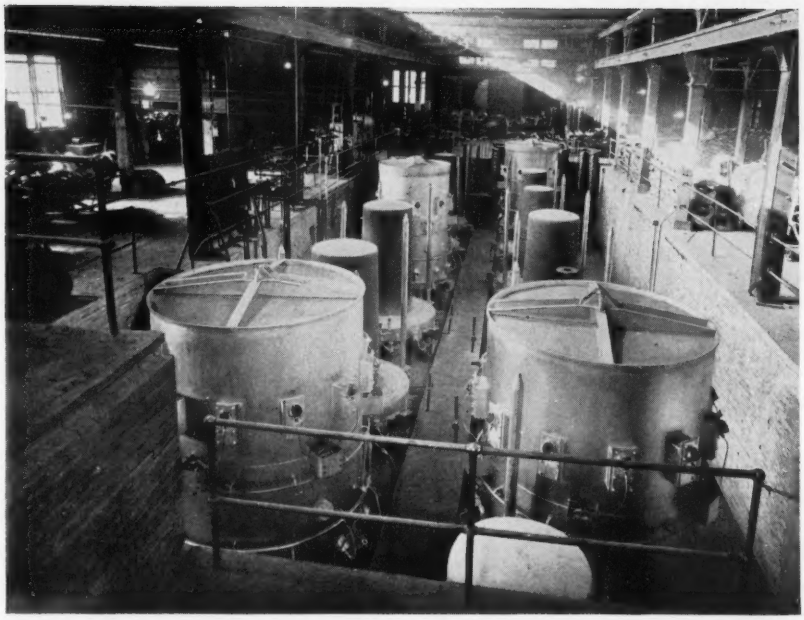

Fig. 4. Panel board for furnaces No. 3 and No. 4, with all four control valve stations conveniently located at left of panel.

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THE four Wilson wire annealing units are now producing 290 tons of bright annealed dead soft wire per week. They are operated with two men per turn, four crews rotating to keep within the working time limit for the week. The quality of the material is excellent and the savings made possible in fuel, labor and cleaning elimination put this new installation in the light of a highly profitable investment.

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Submerged Combustion Comes of Age

By Walter George See,

Sales & Service Manager,
Submerged Combustion Co. of America, Inc., Hammond, Indiana

A paper on Submerged Combustion was presented at The Wire Association Meeting, October, 1939, and published in the October issue of "WIRE & WIRE PRODUCTS." This article contains a description of the process and equipment used to obtain the results described in that paper. ✦ ✦

THE Submerged Combustion Company of America, Inc., now offers a completely automatic submerged combustion burner which has proved itself to be most satisfactory for the heating and agitating of cleaning solutions. Throughout the experimental stage, all research and test work was done in a pickle room under actual working conditions rather than in a laboratory. This was done to insure the ruggedness and dependability of the unit in the field since rough treatment and corrosion are factors which cannot be overlooked in pickle room equipment. The entire system, including ignition of the pilot flame is positively controlled from a single switch so that it may be put into operation by anyone capable of pushing a starting button.

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FIGURE No. 1 is a cross section of the burner as it appears in the tank, showing the controls, the ignition point, pilot flame, and main flame.

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Operation

AS the air and gas are not pre-mixed, a common motor drives an air compressor and a gas compressor to deliver the air and the gas to the burner at a pressure sufficient to overcome the head of liquid in the tank. Where the incoming gas pressure is sufficiently high, the gas compressor may be eliminated. The ignition of the air gas mixture is accomplished in three steps. A hot wire igniter is heated to incandescence by the passage of a high amperage low voltage current. Second, a pilot jet is ignited by the hot wire. Third, the main flow of gas and air is ignited by the pilot flame. The burner is classed as a nozzle mixing type and there is no possibility of backfiring.

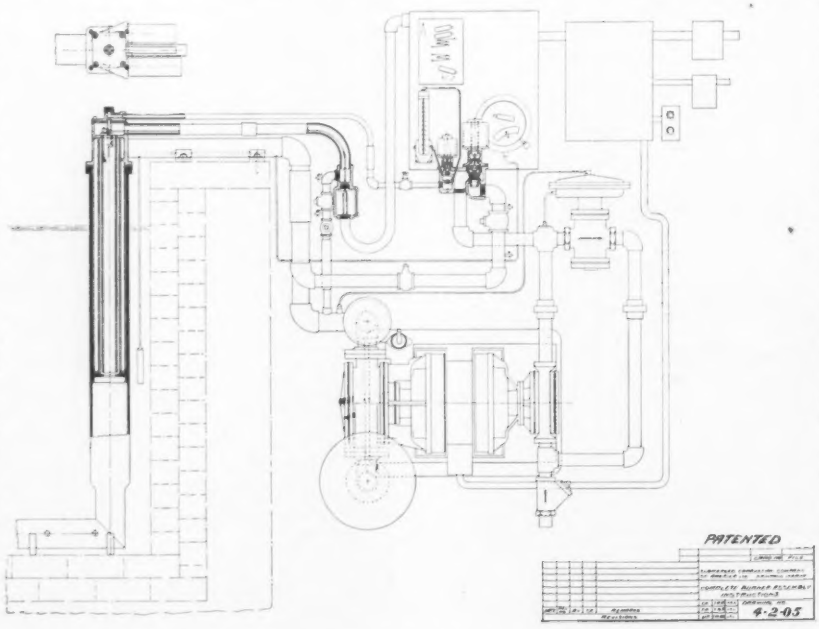

Fig. 1. Cross Section of Burner as it appears in the Tank.

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Controlled Temperature and Agitation

FOLLOWING the ignition of the main gas flame, the burner controls lock themselves into running position until the desired solution temperature is reached. Temperature of the bath is controlled by a thermostat. When the upper limit of the desired temperature is reached, the gas is shut off. The air, however, continues to flow through the burner. In this way, a constant rate of agitation is maintained. When the solution reaches the lower limit of the set temperature range, the thermostat causes the controls to repeat the ignition cycle. Thus, a constant temperature with its attendant advantages and economies is maintained at all times.

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THE burner plate is located beneath the solution level to insure the cooling of the combustion chamber. It directs the flame through this tubular combustion chamber which conducts the products of combustion down to and across the

bottom of the tub. Openings are placed on the horizontal section to distribute the agitation equally.

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THE combustion efficiency of the burner is high. The burner can be set to give any flue gas analysis desired. The general practice is to set the burner for about five per cent excess air.

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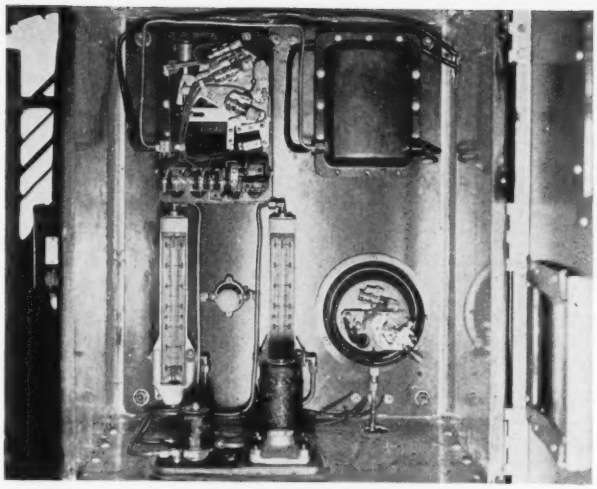
Adaptability

THESE heating units are adaptable to practically any size tub. The combustion chamber can be designed to give proper agitation in almost any shaped vat. They can be used in wooden, brick with concrete, or rubber lined steel tanks with brick insulation with no danger to tub construction. The units take very little space and can be placed so as not to interfere with the material being pickled.



The Control Cabinet.

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Increased Production

ONE of the most practical applications for submerged combustion is the pickling of steel. The rate of scale removal from steel is in almost direct proportion to the rate of agitation. The agitation may be accomplished either by moving the work within the solution or moving the solution about the work.

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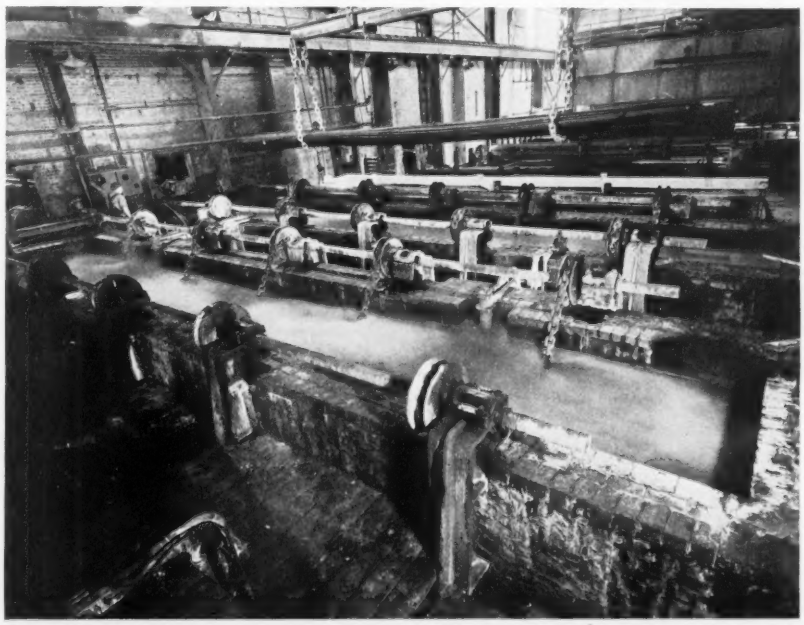
BY the use of submerged combustion, the pickling solution is agitated and moved about the tank at a rate which would be extremely difficult to achieve mechanically. The agitation also serves to keep the temperature extremely uniform throughout practically any size tank. Actually, the temperature differences are so small they cannot be measured by ordinary means. This means a higher quality product, prevents excessive heat consumption, reduces number of rejects, and gives a more uniform product for the customer. In two plants the extreme agitation accounted for an increase in production of well over 100%. The only reason production was not further increased was, the inability of the men and auxiliary equipment to handle the steel at a faster pace. At a common temperature of 165° Fahrenheit, the average pickling time on various grades of steel will run from 30 to 60% of that necessary in steam heated tanks. When it is desirable to operate the pickle tub at a lower temperature, the same rate of production obtained with 195 degrees Fahrenheit using steam can be produced with a 165 degree Fahrenheit using submerged combustion.



The Pickling Tank.

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✦ ✦ ✦

Saves Acid

SUBMERGED combustion evaporates water from the pickle tank instead of diluting it as does steam. When open steam jets are used to heat the vats, the steam condenses in the solution. This dilutes it and raises the working level of the tank until, in many cases it is necessary to drain off a part of the bath to again bring the tub to the correct working level. This makes it necessary to add acid to bring up the acid concentration to its original percentage. Using submerged combustion equipment, however, direct firing in the solution evaporates water, increases the acid concentration and lowers the liquid level of the tank. Water is then added to maintain the correct working level of the solution. The only acid lost is that which is used in the chemical reaction with the steel and the small amount

lost in splashing or dripping from the finished loads as they are removed from the bath. This makes it possible to save from 25 to 50 percent of the acid added during the life of the solution.

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IN one plant in the Calumet Region where submerged heating system is used in the entire pickling department, the following savings were found. Prior to using submerged heating equipment, acid consumption for all tonnage produced, bar and wire, varied from 54 to 60 pounds of acid per ton of steel pickled. During the last two years the complete use of submerged burners has dropped this figure from 26.0 to 29.2 pounds of acid per ton of steel pickled. This shows a savings in acid of from 45.9 to 56.8 per cent over the old acid costs. If the wire pickling figures alone are used, the figure dropped from 66.0 pounds of acid per ton of steel pickled to from 28.0 to 32.4 pounds of acid per ton of steel pickled. This shows a savings of from 50.9 to 57.6 per cent of the old figure on wire rods. They claim a lower figure is possible when they get additional equipment to facilitate the more rapid removal of the pickled steel from the vats.

Flexibility

WHEN equipped with submerged combustion tanks, each pickle tank in a plant can operate as an individual and efficient unit. It is not dependent upon a central generating system whose efficiency falls off at anything under a full load rating. This is particularly important in small plants where the boiler is used for nothing save heating the pickle tanks in summer and the plant and pickle tanks in winter. One plant operating under the above conditions has found it advantageous to discontinue the use of its boilers, install unit heaters for heating the plant and use submerged combustion to heat all of the pickling vats. The lime vats are heated with immersion heaters.

✦ ✦ ✦

AT the present time, there is another plant building up their pickling department with the same idea in mind. Within a year they should be using this system at a great savings in cost over the old boiler steam heat method.

✦ ✦ ✦

IN plants where the steam generating plant is running at full capacity and still more steam is needed elsewhere, submerged combustion units can replace the steam in the pickle room at a substantial saving and allow that steam to be diverted to where it is needed. Such action not only increases production and lowers solution heating costs in the pickle room, but solves the extra steam problem as well. When added capacity in the pickle room is needed and floor space is at a premium, these heating units can increase the production of the existing tubs and save the cost of additional tub construction.

✦ ✦ ✦

Quality, Cost and Production

THUS submerged combustion units offer distinct advantages in each of the three most important phases of manufacturing. Extreme agitation and controlled temperature give a uniform cleaning of better quality. The economies afforded are many. Acid costs are reduced, production is increased due to faster cleaning, which also means a lower labor handling cost per ton. Heating costs can be drastically reduced. It is possible to pickle one ton of steel rods using 100 cubic feet of 1000 B.T.U. gas. Savings accruing from these items have proved in past performances to be great enough to write off the cost of the equipment in an amazingly short time.

THE WIRE TRADE.

Let us tell of wire rods,
Stacked up in the mill,
Raw material for the wire,
Drawn by men of skill;
Processed, tested, watched with care,
Not a flaw to miss;
Health and comfort, life itself
May depend on this.

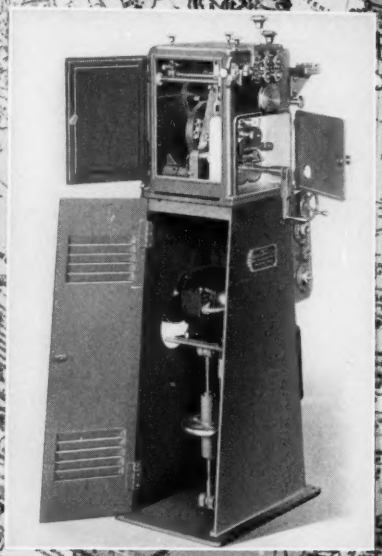
Passed, repassed so many times
Through drawplates of steel,
Maybe then by precious stones,
Finished on the reel;
Countless miles of wire are drawn,
Every kind and size,
As required for endless jobs,
Things to use or prize.

Fencing, nails, hairpins and gauze,
Helps for men and maids;
Springs to ease life's strains and shocks,
All electric aids;
Working, traveling, fighting, sport,
Comfort when we tire,
All are served at night and day
By our product "Wire."

Come then, praise our noble craft,
Let's express our pride;
Wanted in such countless ways,
Useful far and wide;
Rooted in most ancient times,
Needed now as then;
Here's long life, prosperity,
To the Wire Trade and its men.

FRANK WHITELEGG.

The WORLD *of* TODAY
is using SLEEPER & HARTLEY
UNIVERSAL SPRING COILERS



In fact, we have built more automatic Spring Making Machines during the past 25 years than all other manufacturers in the World.

1939 Models of our Universal Spring Coilers are unique in design, greatly improved, increased capacity with controls readily accessible.

SLEEPER & HARTLEY, Incorporated

Worcester, Massachusetts, U. S. A.

Development Work In The Factory

By D. Ward Benson,
Doncaster, England

The outline of a method for limiting, controlling and accounting for a new process or a new product development within an organization. The method outlined is general in character and could apply to any manufacturing process. ✦

WHILST conditions prevailing at the present day in the form of constant change and competition in the public demand for articles make development work essential in any producing organization connected with the Wire industry, a very grave danger is ever present that the cost of such development work may rise out of all proportion to the capability of the organization concerned to meet such a cost on a basis which is economical. Readers will agree, therefore, that it is extremely important that the development work conducted in a factory, and the actual cost of such work, be so arranged that there is at all times an adequate form of control in this direction.

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THE desirability of controlling development costs is even more apparent when it is realized that in many instances the personnel engaged on direct development work are not associated closely with any form of production costs: this personnel's main function being the production of a certain type of commodity.

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INVESTIGATION may reveal that the total development cost of producing preliminary samples of a certain wire product is quite out of proportion to the eventual potential sales value of that item.

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AGAIN all charges connected with development work should be allocated to a Development Account. Most manufactories have a number of small charges which are debited under various headings such as Petty Cash, Trade Expenses or General Expenses, and which rightfully should be charged to Development work.

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Types of Development Work

A SUMMARY is given below of the various types of development work, viz:

(a) Firstly there is a certain amount of work of this nature invariably associated with a normal production programme, and development work in this connection can be sub-divided again into two distinct headings:

1. **The improvement of existing product quality and utility value.**
2. **Production cost reduction in connection with current output.**

(b) The creation of new products.

(c) The perfecting of new ideas as received from outside sources and from these ideas the creation of saleable products.

PROGRESS REPORT

Week ending .....

ITEM	STAGE PREVIOUS WEEK	ADVANCE MADE	ESTIMATED DATE OF COMPLETION	WORK DONE BY:	REMARKS

DIAG. A.

REFERRING to the first item above—The improvement of existing product quality — work of a valuable nature can be performed by a section of the Development department if a continual study is made of quality and the function or utility of the product. Improvements in either or both of these directions, it should be remembered, represent an additional selling feature, and this in turn should create still greater demands for that product.

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THE problem of studying current production in order to reduce costs should be the primary function of any development section, but at the same time the adjustment of machinery and tools and the re-designing of such is an equally important function of the development section.

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THE second heading—The creation of new products — is closely associated with the capabilities of a specific plant layout, and must therefore, be entirely connected with the actual manufacturing and selling policy of the organization as a whole. Any factory designed for normal production could probably include several alternative types of wire production which would be handled in an economical manner. The creation of new products therefore, must be considered from the viewpoint of the individual layout of plant.

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IT can be added, in passing this point, that heavy losses can be sustained if the production of a newly created line of goods is attempted when the general conditions of a particular plant are entirely unsuitable for such work.

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THE third heading—The perfecting of new ideas received from outside sources — is met with in every manufacturing concern, and while the percentage of ideas received from outside sources is generally very high under the heading of "Unsuitable for Manufacture", possibly 5% contain the germ of an idea which can be adapted to the particular requirements of a factory with eventual beneficial results.

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MOST suggestions received from this source have to undergo a certain amount of consideration by the development section to ascertain whether production could be contemplated after such all-important factors as cost, utility value and potential demand have been considered.

Segregation of the Development Department

IT is very essential, the writer would suggest, that all development work should be centralized in one sectional department. Many factories endeavor to carry out development work in a casual manner in productive departments, with the result that either directly or indirectly normal production is slowed down and hindered, increasing the cost accordingly. Preliminary development work should definitely not be associated with normal production, neither should it be undertaken in Producing departments, for to do so is bound to confuse the actual cost of such development work, the general tendency being of course, to liquidate this cost in the normal production costs, with the result that the actual cost of development is never really assessed.

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Development Work and Management

WHEN taking into account the internal management of development work, several factors must be borne in mind. It is suggested first of all that this department should be in the vicinity of the Laboratory, as the various appliances of this section, and fre-

SALES SPECIFICATION FOR DEVELOPMENT

DATE ..... **No.**.....

SAMPLE AND DETAILS REQUIRED BY .....

Size ..... **Type** ..... **Retail Selling Price** .....

Utility Functions .....

.....

.....

Color ..... **Shape** ..... **Maximum Cost Price** .....

Class of Market ..... **Export Requirements** .....

Immediate Packing ..... **Final Packing** .....

Other Details .....

.....

DIAG. B.

quently laboratory knowledge, are often required. It might be added also, that in many organizations the actual personnel of the development section will be found to operate under the direct control of a Development Manager who is responsible to the Chief Chemist.

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A POINT of considerable importance in this connection is that of the allocation of work. Continuity of study, and research, are of course, absolutely essential if satisfactory results are to be obtained within a reasonable space of time. It will be realized that to endeavor to develop or create a number of different products at the same time will take considerably longer than to concentrate upon and conclude one problem at a time.

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IN Diagram A. a Progress Report is shown, and these should be issued regularly; in many cases once a week. These reports should give a record of the progress made on each item of research. Reference to these will also present a very accurate idea of the salary cost for each development job.

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Development and Production Costs

IN AN earlier part of this article it has been pointed out that a very substantial difference will be found, in many cases, between the estimated cost of a new product as created by the Development department, and the eventual cost as obtained under methods of mass-production in the factory. In view of the fact also that the actual cost of such a product must of necessity control the selling price, which in turn will have a substantial effect on the final demand for it, the question of actual cost is naturally a matter of the greatest importance. For this reason, therefore, it is advisable for the following procedure to be adopted as soon as the Development section has satisfactorily created a new wire product.

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A SAMPLE of the product, in completed form, should be handed over to the Manufacturing department who will create a Manufacturing Specification. On this will be given in detail the various material components required for the job, and alternative suggestions given by means of which the general quality and functioning of the article remain unchanged at the same time reducing the cost.

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THE Manufacturing Specification so issued will then assist the Estimating departing to prepare a series of estimates showing the estimated cost of the product, and the cost differences will be emphasized according to the alternative suggestions made thereon.

The Sanction System

WHEN it is agreed that there is need for the creation of a new product, the Sales department should issue a brief specification of the selling requirements of the desired type of goods (see Diagram B.) and on this specification should be included such vital points as the following:

1. **Size, type and color.**
2. **Selling price.**
3. **Type of material and final packing to be used.**
4. **The class of market for which the product should be designed.**
5. **Any individual needs with regard to possible export sales.**

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A SANCTION Form (see Diagram C.) should then be drawn up by the company secretary. This form is, in actual fact, an authority to the Development Manager to expend a limited amount of money in the production of a specific product. If expenditure in excess of this form is incurred, this must be authorized by additional grants. The main advantage in a system of this nature lies in the fact that the cost of any one development job is limited.

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IN recording the cost of development work it should be emphasized that the salaries of persons employed in such a direction must be regarded as a direct labor charge, and must not be expressed as an estimated overhead expense.

No. .....

DEVELOPMENT SANCTION

DATE ..... **PRODUCT or JOB** .....

MAXIMUM AMOUNT ..... **SPECIAL REQUIREMENTS** .....

Week Ending	Salary Cost	Material Cost	Other Costs	Total Cost	Progressive Cost

DIAG. C.

Outstanding Personalities of the Wire Industry

Robert W. Withington, President, American Insulating Machinery Co., Philadelphia, Pa.

ROBERT WALKER WITHINGTON, was born in Philadelphia, June 27th, 1868, son of Ralph Withington and Josephine Walker Withington (who was a native of Canada), and died in Philadelphia on January 5th, 1940.

✦ ✦ ✦

HE was a member of the 85th Class of Central High School of Philadelphia, and after graduation entered the employ of his father, Ralph Withington, in 1884, but continued his studies in engineering. The business was established by his grandfather in 1855, and specialized at that time in lathes for the manufacture of umbrella handles.

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ABOUT 1892, the company started building insulating machines for covering copper wire with cotton or silk for the electrical trade and about 1910 they began to build enameling machines for enameling copper wire.

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IN 1915, the company was incorporated as the American Insulating Machinery Company, and until the time of his decease he was President. For many years the concern has been the principal company selling wire insulating machinery in the United States—and, their product is marketed all over the world.

✦ ✦ ✦

HE was a member of the Wire Association, the Rotary Club of Philadelphia for 26 years, assisted in organizing the Rotary Club of Paris, France in 1920, was formerly President and for many years Treasurer of the Canadian Society of Philadelphia, and was a 32nd degree Mason, being a member of Lulu Temple Shrine of Philadelphia. He is survived by a daughter, Marion Withington, and two sisters, Edith L. Withington and Ellen E. Withington.

ROBERT W. WITHINGTON

B. H. Gedge, Asst. to Vice President of Operations, American Steel & Wire Company

THE appointment of **B. H. Gedge,** manager of operations for the Cleveland district, to assistant to the Vice-President in charge of operations, has been announced by the American Steel & Wire Co. Mr. Gedge succeeds **W. F. Munford,** who has been appointed assistant manager of operations of the Pittsburgh district.

✦ ✦ ✦

WITH the exception of a short period in the far West, Mr. Gedge has spent his entire business career with American Steel & Wire in Cleveland. A native of Indiana, he attended Purdue University and in 1911 started as an electrician at the Cuyahoga Works. He worked his way through various positions and became superintendent at Cuyahoga in 1935 and manager of the Cleveland district in 1937.

B. H. GEDGE
Asst. to Vice President (Operations), American Steel & Wire Company

✦ ✦ ✦

H. B. Carpenter, Asst. Vice President of Operations, Republic Steel Corp.

APPOINTMENT of H. B. Carpenter, manager of the Cleveland district of the Republic Steel Corporation, to the post of assistant vice president in charge of operations is announced. With Earl M. Richards, who holds a similar position, Mr. Carpenter will assist C. M. White, vice president in charge of operations.

✦ ✦ ✦

MR. CARPENTER will be succeeded as Cleveland manager by J. L. Hyland who has been manager of Republic's Chicago district. Mr. Hyland will have charge of the continuous strip mill and various operations acquired by Republic from the former Corrigan McKinney Co.

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Alexander L. Feild, Director of Chemical Research, Rustless Iron & Steel Corp.

ALEXANDER L. FEILD has been appointed director of chemical research, Rustless Iron & Steel Corp., Baltimore. He will remain in charge of patent activities and continue as consulting metallurgist for the Rustless corporation with which he has been associated since 1931. Prior to that he was research engineer and melting superintendent for Simonds Saw & Steel Co., Lockport, N. Y., and has been associated in metallurgical research with United States bureau of mines, Union Carbide & Carbon Corp., and Central Alloy Steel Corp.

(*Please turn to Page 123*)

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in Nov. 1939 and Nov. 1938
(In gross tons)

	NOV. 1939	OCT. 1939	NOV. 1938
Wire rods	4,236	2,779	1,600
Strip steel	9,863	10,251	5,877
Plain, black or galvanized iron or steel wire	6,974	5,271	5,881
Barbed wire and woven wire fencing	6,861	7,167	3,954
Woven wire screen cloth	246	252	110
Wire rope	548	741	278
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	1,195	1,140	818
Wire nails	4,210	2,720	2,122
Tacks	33	37	20
Other nails, including staples	826	586	467
Bolts, machine screws, nuts, rivets and washers	963	814	665
Total, these 11 classifications	35,955	31,758	21,792

Imports of Iron and Steel Wire Into the United States
(In gross tons)

Concrete Reinforcement bars	15	.....	114
Hollow bar and drill steel	71	107	133
Wire rods	917	1,152	803
Barbed wire	174	100	559
Round iron and steel wire	166	286	252
Telephone and telegraph wire	.....	.....	7
Flat wire and strip steel	226	273	302
Wire rope and strand	121	54	157
Other wire	45	18	208
Hoops and bands	363	185	1,658
Nails, tacks and staples	162	73	842
Bolts, nuts and rivets	9	10	21
Total, these 12 classifications	2,269	2,258	5,056

Exports of Insulated Wire and Cable, November 1939

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Rubber-covered wire	598,349	$144,538	123,576	$ 23,578
Weatherproof wire	207,690	33,612	151,074	26,197
Other insulated copper wire	580,680	148,669	296,716	43,764
Nickel-chrome electric resistance wire	69,135	77,815	.....	.....
Total, these 4 classifications	1,455,854	$404,634	571,366	$ 93,539

Exports Up in November — Imports Lower

EXPORTS of iron and steel products (scrap excluded) from the United States totaled 332,899 gross tons valued at $22,791,622 in November. This was an increase of 30.5 percent in quantity and 35.4 percent in value over the 255,081-ton, $16,835,795 trade of October, and topped the 196,185-ton, $11,527,134 trade of November 1938 by even wider margins.

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EXPORTS of iron and steel over the eleven months of 1939 were 6.2 percent greater in quantity and 17.8 percent higher in value than during the comparable period of 1938. Between January 1 and November 30, 1939, 2,104,967 tons of these products valued at $150,896,242 have been exported against 1,982,835 tons valued at $128,082,608 recorded for the first eleven months of 1938.

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Increase in Exports Worldwide

ALL the world, except for Africa, participated in the gain in the November trade. The largest increase took place in the trade with South America—28,809 tons or from 39,936 tons in October to 68,745 tons in November. The Far East was second with an increase of 23,073 tons to a November total of 72,680 tons, while third was North and Central America and the West Indies with shipments gaining 19,141 tons to total 97,769 tons with Europe fourth with a gain of 13,842 tons lifting this total to 88,474 tons. It is pertinent to note here that Finland alone of the European belligerents took more steel in November than October—her purchases rising to 769 tons from 568 tons in the month preceding. Exports to African markets, as noted above, declined in November to 5,231 tons from 12,278 tons in the month before.

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Imports Again Lower

IMPORTS of iron and steel products (excluding scrap) totaled 14,379 gross tons valued at $1,005,774 in November in comparison with the 16,884 tons valued at $1,147,656 imported in October, and with the 22,878 tons valued at $1,402,221 which came in during November 1938.

✦ ✦ ✦

IMPORTS for the first eleven months of 1939 at 272,227 tons were still ahead of the 217,851 tons imported in the same period of 1938. The total value for 11 months of 1939 was $16,265,584 against $13,594,779 in the comparable months of 1938.

✦ ✦ ✦

Scrap Shipments Down

SHIPMENTS of scrap to foreign countries during November totaled 272,656 gross tons valued at $5,173,374. In October this trade had totaled 336,775 tons valued at $5,730,606 and in November 1938, 273,403 tons valued at $4,000,084. Eleven months exports top those of the comparable period of 1938 by 26 percent in both quantity and value. Between January 1 and November 30, 1939, 3,371,025 tons of scrap valued at $51,746,059 have been exported from the United States to foreign buyers against 2,675,196 tons valued at $41,034,463 in that same period of 1938.

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Canada Again Leading Market

IN NOVEMBER, Canada was the outstanding market for United States iron and steel products with a total of 66,140 tons. Leading items in this varied trade were skelp, 25,359 tons; non-alloy black steel sheets, 8,242 tons; plain shapes, 6,470 tons; and non-alloy "other" plates, 4,454 tons. The United Kingdom was second with a total of 31,452 tons consisting almost entirely of non-alloy ingots,

18,166 tons and pig iron, 12,234 tons. Pig iron, 21,470 tons; non-alloy "other" plates, 3,309 tons; and tin plate, 1,172 tons; accounted for the bulk of Sweden's total of 26,876 tons, while in Japan's 26,-160-ton total was included 16,808 tons of alloy ingots, 4,647 tons of non-alloy ingots, 1,559 tons of alloy "other" steel bars, and 1,218 tons of car axles without wheels.

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Scrap Trade Lower

NOVEMBER scrap exports totaled 272,656 tons valued at $5,173,374 in comparison with 336,775 tons valued at $5,730,606 shipped in October. Included in the 272,656-ton total are 271,293 tons of iron and steel scrap, 476 tons of tin plate scrap, 199 tons of tin plate circles, strips, etc., and 688 tons of waste-waste tin plate. Leading markets for iron and steel scrap in November were Japan, 180,538 tons; the United Kingdom, 30,960 tons; Canada, 23,108 tons; Sweden, 13,359 tons; and Italy, 11,252 tons.

✦ ✦ ✦

Lower Import Trade in November

THE most important item in the 14,379-ton iron and steel import trade was the 3,233 tons of spiegeleisen — furnished by Canada, 3,226 tons, and France, 7 tons. Principal suppliers of pig iron were British India, 1,290 tons, and Canada, 1,272 tons, while Norway was the source of 2,226 tons and the Netherlands of 239 tons of the 2,465 tons of ferro-manganese received.

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Wood Screws

EXPORTS of iron and steel wood screws during November 1939 totaled 45,586 gross valued at $6,-778. Of this total, Cuba took 15,-101 gross valued at $2,170; Mexico, 8,595 gross valued at $862; Costa Rica, 5,139 gross valued at $746; Australia, 4,015 gross valued at $497; Canada, 3,220 gross valued at $407; Guatemala, 3,120 gross valued at $623; Salvador, 1,594 gross valued at $422; Dominican Republic, 1,141 gross valued at $223.

✦ ✦ ✦

EXPORTS of brass wood screws during the same month totaled 8,802 gross valued at $3,702. Of this total Panama, Canal Zone, took 2,429 gross valued at $1,062; Cuba, 1,550 gross valued at $481; New Zealand, 1,195 gross valued at $445; Canada, 902 gross valued at $481; Colombia, 716 gross valued at $79; Argentina, 460 gross valued at $156; Philippine Islands, 346 gross valued at $371; Netherlands West Indies, 272 gross valued at $132.

✦ ✦ ✦

IMPORTS of wood screws during the same month totaled 6,020 gross valued at $165, supplied chiefly by Japan with 6,000 gross valued at $158, and the balance supplied by Canada, valued at $7.

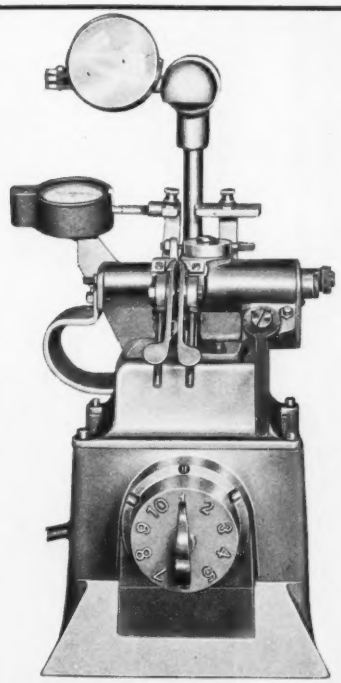
MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.

Model E.-1-S Welder Capacity .010 to .062" high & low carbon wire.



MICRO PRODUCTS COMPANY
20 NORTH WACKER DRIVE, CHICAGO, ILL.
Telephone, State 7468

IN the Robertson Closed Lead Melting Pot, CO_2 gas is used to keep down the formation of oxides over the lead in the melting pot and also during the process of filling the extrusion cylinder with lead.

The large valve opening with free flow helps to quickly fill the extrusion cylinder; the valve is entirely outside of the melting pot so that it may be easily cleaned and serviced.

The filling tube serves as a melting chamber and the main body of the pot serves as the storage where the molten lead is quite free from agitation. Oxides and dirt from the lead pigs, which may be sluggish, float to the top of the closed quiet storage space and are trapped. Only clean lead is drawn from storage to extrusion cylinder, previously flushed out with CO_2 gas.

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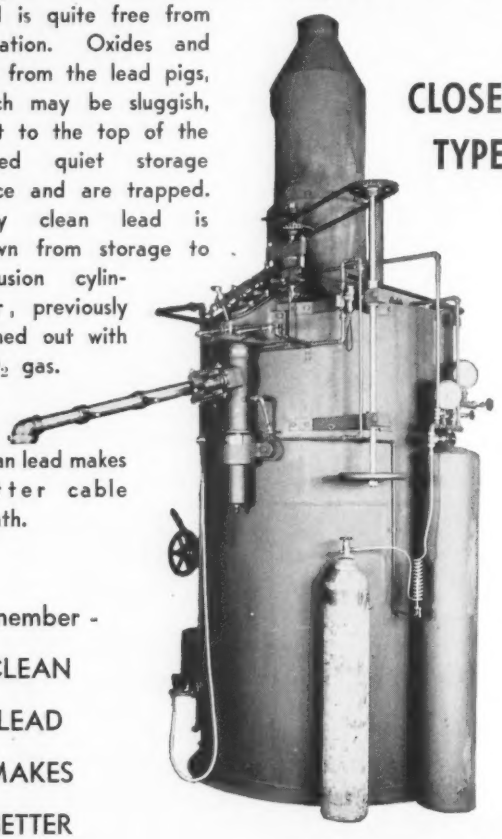


Clean lead makes better cable sheath.

Remember -

CLEAN

LEAD

MAKES

BETTER

SHEATH

!

ROBERTSON LEAD MELTING POT

JR

JOHN ROBERTSON COMPANY, INC.
125-137 Water Street
Brooklyn, New York

Investigate! Compare! Complete operating and performance data is yours to examine. A note on your letterhead brings it to your desk. No obligation, of course.

"Year-end" Statement by L. Gerald Firth, President, Firth-Sterling Steel Company, McKeesport, Pennsylvania

The Firth-Sterling Steel Company is sole owner of the Wolf Tongue Mining Company, operating tungsten mines and milling plants in Boulder County, Colorado. ✦ ✦ ✦ ✦ ✦

THE assurance of a supply of American mined tungsten ore was a major factor in the November stabilization of prices on High Speed tool steels. The progressive development of the domestic tungsten industry is the direct result of a duty on imported tungsten ores, and here we have the paradox that a protective tariff does not necessarily penalize consumers. In this case, it has had the effect of placing a ceiling as well as a floor on prices.

✦ ✦ ✦

IN the period from 1913 to 1922 there was no tariff on tungsten ore imports with the result that prices fluctuated wildly, and at severe penalties to consumers when considered over the full range of the period. The high figure was reached during 1916, when the price exceeded $5,000 per net ton on 60 per cent milled ore. The price during 1913, after removal of an earlier tariff, ranged between $400 and $500, while in 1921 it down-spiraled to the ridiculously low figure of $130 on the same grade of ore.

✦ ✦ ✦

THE advantage of the low prices to consumers was, of course, short lived in every case, since they occurred during periods of low demand and therefore served primarily as a weapon to destroy domestic sources—being only a fraction of domestic mining costs. Interruption of domestic mining is very costly. This is because American ore bodies are under ground at considerable depths, and continuous operation is necessary to prevent flooding of mine shafts. When this occurs, shafts and galleries soon cave in and can never be reopened.

✦ ✦ ✦

THE present price of milled 60 per cent tungsten ore is ap-

proximately $1,500 per net ton, with the tariff on imported ores amounting to about 30 per cent of this figure. American consumption of tungsten amounted to $16,000,000 in 1937 and will approximate $10,000,000 for the past year. Better than half of the 1939 total was American produced. The strategic importance of the metal is greater, however, than the dollar consumption implies. Prices and availability affects many industries. The foremost uses of the material are in the manufacture of household Mazda lamps; tool steels; sintered carbide dies and tools; radio tubes; airplane and automobile valves; electrical contacts; and X-ray targets. In most of these the metal is virtually indispensable though the unit amounts may be very small.

✦ ✦ ✦

WITHOUT the development of domestic sources — impossible without the assistance of the tariff—there is no doubt but that the September rush of buying would have found the United States tragically short in tungsten supplies. This would have created a choice moment for foreign suppliers to skyrocket prices again. The present price of 67 cents per pound on 18% tungsten steel could not then have been maintained and we might have been on the way to the $2.50 price reached in 1918.

✦ ✦ ✦

IN contrast to this possibility and past experience, the tungsten market has been orderly — with consequent calm in dependent consumer circles. Moreover, considerations of national defense make it vital to eliminate, insofar as possible, dependence on foreign sources for any strategic metal. Given this continued tariff protection and understanding, there is every reason to believe that the tungsten mining industry can push its development and continue to maintain reserves to assist in meeting emergency needs and preventing scare purchasing cycles.

This is an invitation for you to become a member of The Wire Association. ✦ ✦ ✦ ✦ ✦ ✦

Wire that "always tells the TRUTH"!

Some wire looks good — seems like a good value — until it goes into your product!

Keystone wire offers you a sound, well-known reputation for truthfulness — absolute uniformity — in analysis, characteristics, finish. You simply specify the exact job your wire must do. One of our many regularly stocked grades may fill the bill. Or Keystone's technical staff will create a wire that's true to your specifications.

Why not let us look over your wire problems? We'll tell you the "truth" about better production, and, possibly, lower costs for your product.

KEYSTONE

STEEL & WIRE CO., Dept. W, PEORIA, ILL.

HIGH CARBON or LOW CARBON

SAMSON SPRING WIRE

Bright . . . Tinned
Coppered
Annealed
Galvanized

'Round the World With the Wire Industry

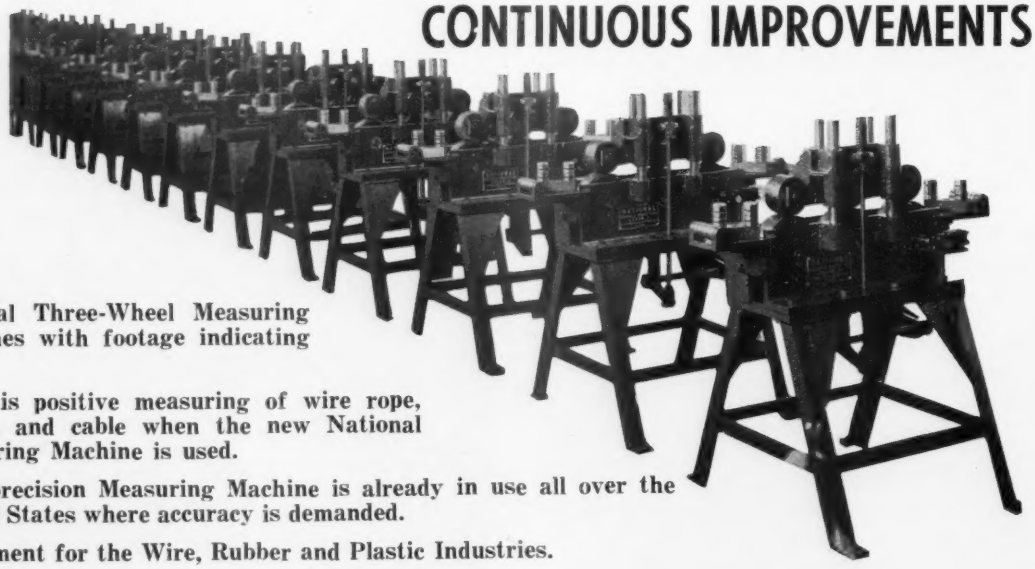
WHILE the war is going on, the wire business is showing small changes. The new sharpened blockade is not expected to change the German export trade greatly as the overseas business via Neutrals has been small except in the Far East with Japanese and Italian ships via Italian ports. At the moment it cannot be said how the business via Italy will be affected. No exact figures have been received with regard to the export trade during October and November, but the German cartel maintains the assumption that the tonnage exported is about 70% of the normal. Production for this period is claimed by the leading makers to be "about normal" with no decline as yet. The problem of labor is not making any difficulty as comparatively few men were called to arms.

+ + +

PRICES for export are unaltered since the last reports, but are greatly fluctuating according to the markets. Wire rods are now sold at £ 7.7.6 - 7.15 (gold); bright wire £ 8.0 - 8.12.6; galvanized fencing wire 9.12.6 - 10; barbed wire 10.5 to 10.15, the latter being nominal. The discount off the British standard list for wire netting is 76 - 77½% for hexagonal quality. This quotation is mainly for the Belgium-Luxembourg industry, as Germany selling mainly by clearing is moderately engaged in markets with sterling prices. All Balkan markets are buying briskly particularly Roumania. Much of the business is certainly speculative as buyers on the Balkan peninsula not believing in the stability of their currencies buy whatever they can get. Scandinavia buys normally and all trade agreements have been renewed. Holland and Switzerland buy very little however, Italy buys very well.

CONTRARY to the wire trade, business in wire machinery is very quiet as France and Great Britain were Germany's best customers. Russia has much more interest in other machinery than in wire making. Overseas business continues only with Japan. Shipment times for wire and wire products being unaltered the German industry is guaranteeing all deliveries, as follows: Wire nails, 8-10 weeks; bright wire, 6-8 weeks; galvanized 7-9 weeks; after acceptance. Wire rope is offered in very small quantities and the German industry holds back. Wire rods are sold, but as before the war, only in small lots. The domestic market has had no restrictions in sale of nails, tacks, staples and square netting, but fencing and barbed wire are strictly rationed. Wire mesh is sold for export, only by license, and is difficult to obtain, being the only product of which this is the case.

CONTINUOUS IMPROVEMENTS



National Three-Wheel Measuring Machines with footage indicating dial.

There is positive measuring of wire rope, strand, and cable when the new National Measuring Machine is used.

This precision Measuring Machine is already in use all over the United States where accuracy is demanded.

Equipment for the Wire, Rubber and Plastic Industries.

NATIONAL RUBBER MACHINERY CO.

General Offices: AKRON, OHIO

Banner Division, COLUMBIANA, OHIO
Eastern Division, CLIFTON, N. J.

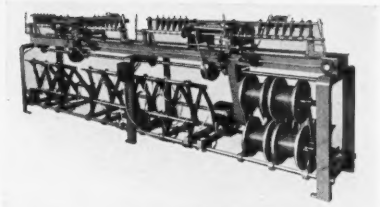
David Bridge & Company, Ltd., Manchester, England
The Bawden Machine Company, Ltd., Toronto, Canada

Screw Traverse Type Multiple Wire Spooling Machine Developed By Fidelity Machine Company

SHOWN above is a front view of machine especially adapted for winding wire up to .035 inches in diameter. Built in sectional units, each unit is designed to wind 12 spools of 1⅝" traverse, or 8 spools of 2½" traverse. Each unit is provided with a measuring device with automatic stop motion, and racks underneath for holding 12 reels, 12" diameter. These reels are provided with electrically controlled brake bands, which automatically apply pressure the instant that the measuring device stops the winding spindle, thereby keeping the wire always under proper tension and avoiding any possible entanglement of adjacent wires.

✦ ✦ ✦

THIS machine has detachable spindle ends which can be removed instantly by simply pulling the vertical lever located just outside the end bearings. Spare spindles can be loaded with empty



Screw Traverse Type Multiple Wire Drawing Machine.

✦ ✦ ✦ ✦

spools while those on the machine are being wound. These can then be put in place on the machine as soon as the spindles with filled spools are removed, with the minimum of time loss for spool changing.

✦ ✦ ✦

THE Fidelity Machine Company has recently issued a condensed booklet describing the different types of Fidelity spool machines which are now standard with the company.

✦ ✦ ✦

THIS booklet shows the application of the machines to such products as braids, cellophane, cotton, fiber, paper strips, heater cords, silk, solder, tape, wire, etc.

IT contains a great deal of usable information. Copies of the booklet may be obtained by addressing the Fidelity Machine Company, 3908-18 Frankford Avenue, Philadelphia, Pa.

✦ ✦ ✦

James Harvey Gravell

IT is with deep regret that we announce the death of Mr. James Harvey Gravell, President of the American Chemical Paint Company, Ambler, Pa.

✦ ✦ ✦

MR. GRAVELL was well known to our industry and will be greatly missed by his many friends and acquaintances.

✦ ✦ ✦

Railroad Association Issues Revised Wire, Cable Standards

THE 1939 issue of Specifications for Wires, Cables, and Tapes has been made available by the Operations and Maintenance Department of the Association of American Railroads, to supersede the 1935 edition of the same specifications. The Signal Section of the Engineering Division has charge of this work.

HAVE YOU A HOT ROLLING PROBLEM?

Where careful metallurgical control and skilled work is required on ferrous and non-ferrous alloys — our services can be of real value to you.

We are expertly equipped to hot roll any metal into bars, rods and flats on a contract or toll basis.

We can handle ingots or billets up to about 6" x 6" and hot roll to as small as ¼" diameter in coils. Also a wide variety of square and flat sizes.

SEND US YOUR PROBLEM!

WILBUR B. DRIVER CO.

NEWARK, NEW JERSEY

Melters and Manufacturers of "TOPHET" Resistance Wires—Nickel Chrome Alloys—Copper Nickel Alloys—Pure Nickel and Monel Wire and Strip—Stainless Steel Rods and Wire.

A Review of Recent Wire Patents

No. 2,182,069, SPRING CUSHION, Patented December 5, 1939 by Nicholas Contino, Chicago, Ill., assignor to Burton-Dixie Corporation, Chicago, Ill., a corporation of Delaware.

In the use of hour glass shaped wire springs, means is provided to prevent the smaller, underlying coils to project through the upper, larger end coils.

✦ ✦ ✦

No. 2,182,092, SCREW AND THE METHOD OF MAKING SAME, Patented December 5, 1939 by Theodor A. O'Leary, New York, N. Y., assignor of one-third to Winslow Foster and one-third to Herman Wunderlich, both of Brooklyn, N. Y.

The five claims in this patent cover the method of providing a dove-tailed slot in a screw head.

✦ ✦ ✦

No. 2,182,568, SCREW, Patented December 5, 1939 by Carl G. Olson, Chicago, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

Cross-shaped slots are provided with the slots falling short of the periphery of the head, whereby the screw driver will not be apt to become laterally dislodged.

✦ ✦ ✦

No. 2,182,667, ELECTRICAL CABLE, Patented December 5, 1939 by Fred R. Kaimer, York, Pa., assignor to General Electric Company, a corporation of New York.

A heat, flame and moisture resisting rubber covering for wire electrical cables is provided, containing halogenated aromatic carbon ring compounds, such as "Halowax".

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

✦ ✦ ✦

No. 2,182,668, ELECTRICAL CONDUCTOR AND INSULATION THEREFOR, Patented December 5, 1939 by Fred R. Kaimer, York, Pa., assignor to General Electric Company, a corporation of New York.

Where an intermediate covering for a wire cable (electric) includes a varnished material (such as cambric) with an outer sheath of felted asbestos, this inventor places between them a moisture and abrasion resistant electrically insulating material, such as regenerated cellulose (Cellophane).

✦ ✦ ✦

No. 2,183,243, METAL FASTENER, Patented December 12, 1939 by Johann Meersteiner, Saaz, Czechoslovakia, assignor of one-half to the firm Bechert & Co., Drahtstifte-, Schraubenund Stahlindustrie - Aktiengesellschaft, Saaz, Czechoslovakia; Freida Meersteiner administratrix of said Johann Meersteiner, deceased.

A screw adapted to secure metallic plates, etc. together, is provided, the shank having peaked or pointed tooth elements instead of threads.

No. 2,183,688, MEANS FOR AND METHOD OF ROLLING SCREW THREADS, Patented December 19, 1939 by Carl G. Olson, Chicago, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

The core at the entering end of the screw shank (for a screw of the self-tapping kind) increases in diameter and the threads thereon decrease in crest diameter.

✦ ✦ ✦

No. 2,183,689, THREAD FORMING MECHANISM, Patented December 19, 1939 by Carl G. Olson, Chicago, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Ill.

A die block is provided having thread-forming serrations, some of constant depth and some of diminishing depth.

✦ ✦ ✦

No. 2,184,502, WIRE ROPE CENTER, Patented December 26, 1939 by Frank R. Metcalf, Auburn, N. Y., assignor to Columbian Rope Company, Auburn, N. Y., a corporation of New York.

In this wire rope, the center is of fibres, having a lubricant incorporated therewith and a sealing material for retaining the lubricant.

✦ ✦ ✦

No. 2,184,517, BEDSPRING, Patented December 26, 1939 by William J. Duvall and Gerald W. Froemke, St. Louis, Mo., assignors to Smith & Davis Manufacturing Company, St. Louis, Mo., a corporation of Missouri.

Double-bed spring assemblies are pro-

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

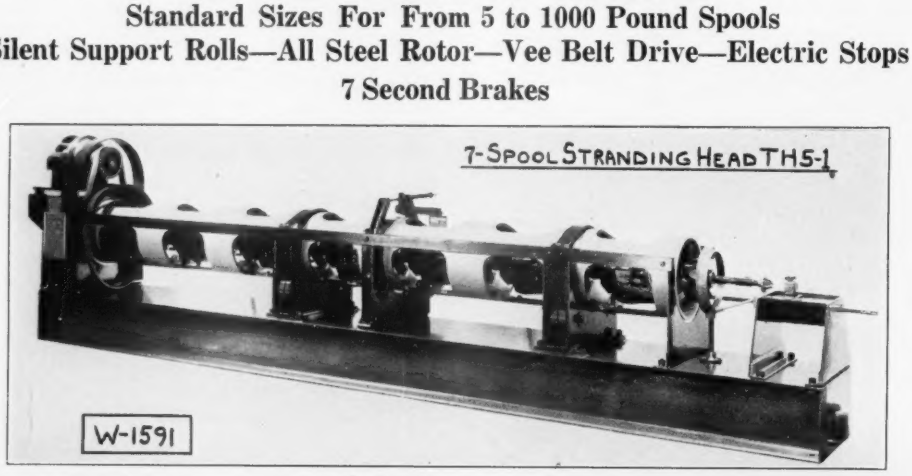
PATERSON, NEW JERSEY, U. S. A.

TUBULAR STRANDING MACHINES

Standard Sizes For From 5 to 1000 Pound Spools

Silent Support Rolls—All Steel Rotor—Vee Belt Drive—Electric Stops

7 Second Brakes



ELECTRICAL WIRE, CABLE & WIRE ROPE MACHINERY

Printed Literature Available On Considerable Of The Equipment Used In These Fields—Inquiries Are Invited

vided in which the springs are so arranged that excessive compression of one-half will not effect the compression of the other half.

✦ ✦ ✦

No. 2,184,858, DRIER FOR POLISHED NAILS, Patented December 26, 1939 by Jean Goodman, New York, N. Y.

The assembly includes a hollow body having an open side through which the fingers of one's hand may be inserted, a closed compartment in the hollow body and having a perforated top wall upon which one's fingers may be rested, a hot air producing mechanism within the compartment, a shut-off plate mounted beneath the perforated top wall to close the perforations, means for moving the plate to open the perforations and controlled with one's finger, and a flexible closure mounted over the open side of the hollow body, the flexible closure being supported at its top along the top of the opening and the other portions of the flexible closure, depending and engageable about one's wrist for almost completely closing the open side to prevent the loss of air therethrough.

✦ ✦ ✦

No. 2,184,952, RUSTPROOFING COMPOSITION, Patented December 26, 1939 by John C. Zimmer, Hillside, N. J., and Jack B. Crutchfield, Richmond, Va., assignors to Standard Oil Development Company, a corporation of Delaware.

For rustproofing iron, etc., this inventor provides a composition comprising a hydrocarbon coating vehicle containing at least 5% of an aldehyde-free unsaturated distillation residue of acids produced by the low temperature liquid phase catalytic oxidation of hydrocarbon wax at atmospheric pressure.

✦ ✦ ✦

Outstanding Personalities of the Wire Industry

(*Continued from page 115*)

A. J. Hoyt, Manager, Cleveland District, American Steel & Wire Co.

MR. A. J. HOYT, the new manager of the Cleveland district, formerly assistant manager of Worcester, Mass. district operations, was born in South Norwalk, Conn., and started with the Wire Company in 1914 as assistant foreman at the Trenton, N. J., plant. He, too, worked his way up through various positions and has recently been assistant manager of the Worcester district.

A. J. HOYT
Manager of Operations, Cleveland District, American Steel & Wire Company

✦ ✦ ✦

Peter Stewart

IN addition to these appointments, **Peter Stewart,** superintendent of South Works, Worcester, will succeed Mr. Hoyt as assistant manager of the Worcester district and **G. A. Gleason** has been appointed general superintendent at South Works, while **L. J. Westhaver** has been made superintendent of the steel works and **F. P. Leahey** has been made superintendent of the wire mill, both at South Works.

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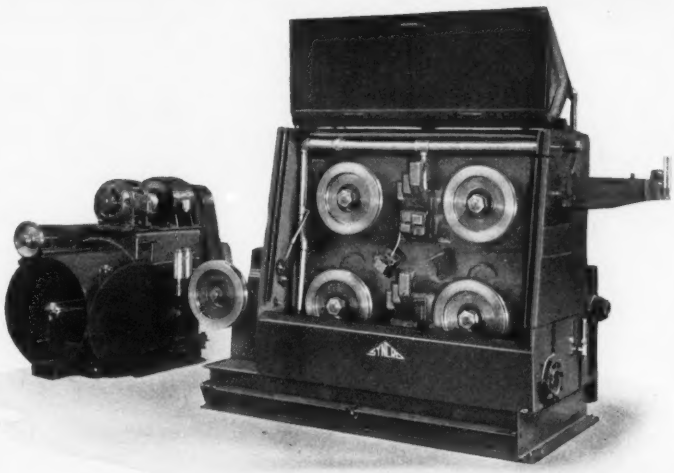
FOUR changes in the main office engineering department have

(*Please turn to Page 124*)



Syncro type "D" machines now give you
wider range, greater simplicity and economy

Recent improvements in the Syncro type "D" wire drawing machine give the following results.

- Power increased to 125 H.P. — Maximum entering size is now ¼" rod.
- Block faces equipped with easily replaced blue steel tires.
- A small, movable tallow box reduces waste.
- Frictionless piston ring seal prevents oil and solution from mixing.
- Single or double faced capstans available. Double faced capstan provides two operating speeds.
- Spooler is driven smoothly and without starting or stopping shocks by a Syncro Magnetic Slip Clutch.
- Spooler is equipped with expanding arbor which locks reel on arbor and thus eliminates vibration.

Write for complete details.

Syncro Machine Company

Graybar Bldg., New York — McCormick Bldg., Chicago

Represented in Canada by — Canadian Elevator Equipment Co., Ltd., Toronto.

Outstanding Personalities of the Wire Industry

(*Continued from page 123*)

been announced by the American Steel & Wire Company.

✦ ✦ ✦

A. G. MONTGOMERY, superintendent of hot mills at Cuyahoga Works, Cleveland, has been appointed assistant chief engineer for the company, while **F. W. Lorig** has been appointed engineer for appropriations and properties, **W. V. Magee** has been made construction engineer and **F. E. Robinson,** assistant construction engineer.

✦ ✦ ✦

MR. MONTGOMERY brings to his new position a wide experience in the engineering field and in the steel industry. He was graduated from Pennsylvania State College as an electrical engineer and during summer vacations worked with the National Tube Company which, along with American Steel & Wire, is a subsidiary of the United States Steel Corp. His first experience with the Wire Company started as a district engineer in Pittsburgh in 1914. Since then he has held a variety of engineering positions with the company. In his new position he succeeds F. R. Burnette, who recently was transferred to Carnegie-Illinois Steel Corp.

✦ ✦ ✦

MR. LORIG has been with the company since 1915 and has had a wide experience in engineering.

✦ ✦ ✦

MR. MAGEE started with the National Tube Company in 1925 and joined American Steel & Wire in 1927. He has been assistant construction engineer.

✦ ✦ ✦

MR. ROBINSON, after previous service in the steel industry, joined the Wire Company in 1929 and has been section head draftsman.

✦ ✦ ✦

Charles P. Gulick, Chairman of Board, National Oil Products Co.

CHARLES P. GULICK, of 135 South Munn Avenue, East Orange, N. J., chairman of the board of the National Oil Products Co., Harrison, N. J., has been elected president of the Manufacturer's Club of West Hudson County, N. J.

E. P. Geary, Asst. to Vice President, Rustless Iron & Steel Corp.

E. P. GEARY has been named assistant vice president in charge of sales for Rustless. He recently returned from England where he was assistant managing director of British Stainless Steel, Ltd. Formerly he was midwestern sales manager of Rustless, with headquarters in Chicago. For 13 years Mr. Geary was associated with Vanadium Alloys Steel Co. and Colonial Steel Co. in various capacities in the production, metallurgical and sales divisions.

✦ ✦ ✦

Wayne Wire Die Company, Inc., Now at Jersey City, N. J.

ANNOUNCEMENT is made of the removal of the office and factory of the Wayne Wire Die Company, Inc., from 57 Sheridan Street, Irvington, New Jersey, to 133 Mountain Road, Jersey City, New Jersey. The new telephone number is Journal Square 4-4311.

✦ ✦ ✦

THE removal was necessitated by the marked increase in business which created the need for greatly enlarged quarters.

New Flame-Hardening Process Gives Greater Hardness

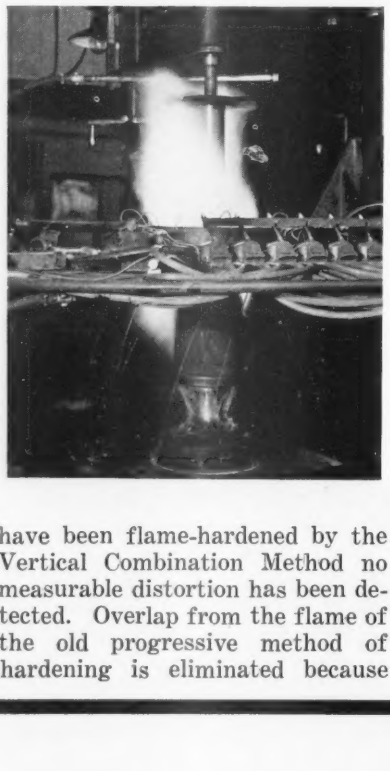
A HIGHER degree of hardness in steel and alloy iron rolls, mandrels, etc., is being obtained by a new flame-hardening process developed by Linde Air Products Company and in operation at the plant of Farrel-Birmingham Company, Inc., Ansonia, Conn.

✦ ✦ ✦

THIS new process is known as the Vertical Combination Method. By using it Farrel-Birmingham are able to raise the hardness of a 65-70 carbon steel cylindrical object to approximately 90 or better on the Type "C" Scleroscope. They have also tested the process considerably in hardening a special dry sand alloy cast iron known as "Farreflame," and have obtained an average hardness of 80 on the Type "C" Scleroscope.

✦ ✦ ✦

ANOTHER advantage of this new flame-hardening process, according to Farrel-Birmingham, is the fact that in all the rolls that



have been flame-hardened by the Vertical Combination Method no measurable distortion has been detected. Overlap from the flame of the old progressive method of hardening is eliminated because the new process is continuous, uses a large number of flame tips and is followed immediately by a water spray quench.

✦ ✦ ✦

THE Vertical Combination method has proven very advantageous in many applications. Among these are the following: rubber engraving rolls, embossing rolls, calender rolls under certain conditions, different types of mandrels where excessive pressure of wear must be taken into consideration, certain applications for rolling mills, dough machines, wearing surfaces of bearers in printing machinery and numerous other applications.

✦ ✦ ✦

FULL information regarding this new process of hardening will be furnished by Farrel-Birmingham Company, Inc., to interested executives and engineers who care to write to the company's offices at Ansonia, Conn.

Aluminum Hoist

ELECTRO LIFT, INC., 30 Church Street, New York, N. Y., announces a new, light weight, high speed, cable type electric hoist with all castings of aluminum alloy. This hoist is shown in the cut below.

✦ ✦ ✦

IT has been designed for the lightest possible weight consistent with the heavy duty service for which the hoist may be used. The light weight makes it especially suitable for applications requiring frequent moving and handling. It is also particularly suitable for use in steam and acid fumes on account of the non-corrosive properties of the aluminum alloy.

✦ ✦ ✦

IT is built in sizes of from ⅛ to 3-tons and has all of the speeds and ratings of standard ELECTRO LIFT Hoists. It may also be equipped with traveling rope guide to eliminate the hazard of crossed or piled up cables where loads are pulled at an angle from the vertical.

✦ ✦ ✦

THE hoist has worm drive with worm and wheel running on Timken tapered roller bearings, fully enclosed within the gear case and running in a bath of oil. This provides simple construction and quiet operation. The motor has ball bearings and is directly attached to the hoist frame giving compact arrangement. The hoist has close headroom allowing the hook to reach within a minimum distance of the overhead track.

✦ ✦ ✦

THE control may be either rope or push button type. Top and bottom limit switches may also be provided to stop the load in each direction of travel, preventing running the cable off the drum and providing accurate stop at the bottom as well as at the top.

✦ ✦ ✦

Engineering Bulletin

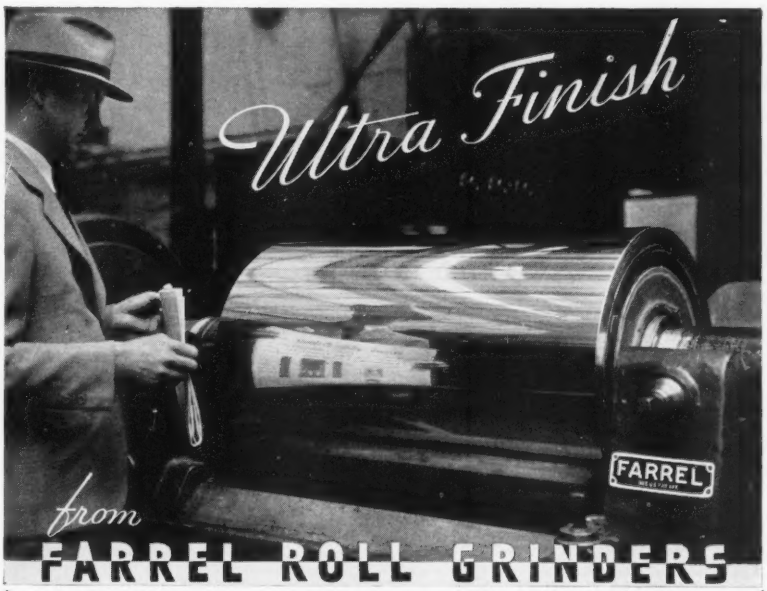
THE fundamentals of cutting steel with carbide tools—a subject that has vitally concerned metal working executives for many years — are contained in Engineering Bulletin GT-120 just published by Carboloy Company, Inc. This is the first bulletin on this subject ever issued by Carboloy Company and contains comprehensive instructions based upon an extended period of developmental work.

✦ ✦ ✦

AN extremely practical feature of this bulletin that should appeal to all shopmen is a set of charts giving specific carbide grades to use, recommended starting speeds, general range of practical speeds, and recommended tool rakes and clearances for a wide range of steels. The charts also provide a means for determining the power required for each material.

✦ ✦ ✦

A COPY of the Bulletin, GT-120, may be obtained without charge from Carboloy Company, Inc., 11171 East 8 Mile Road, Detroit, Michigan.



The roll shown in this unretouched photograph is typical of rolls used for rolling different kinds of sheet and strip of metals and other materials which must have a smooth, highly finished, flawless surface. To roll such sheets the rolls must be accurately ground with a highly reflective surface as shown.

This is routine work for Farrel Roll Grinders. Their precision construction and many superior design features enable them to grind rolls of any material with any desired finish which can be obtained with wheels at present available. Their smooth, vibrationless operation produces a perfect surface free from marks of any kind.

And when it is necessary to cut deep to remove stock their rugged construction permits the heaviest roughing cuts to be taken. They are designed and built to perform the whole range of roll grinding operations from roughing to the finest mirror finish.

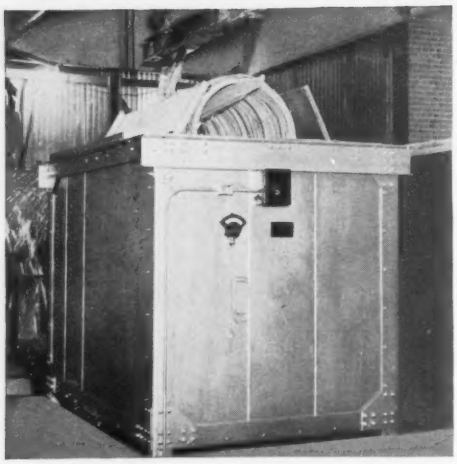
Send for a copy of Bulletin No. 111 describing the features of design and construction which contribute to the high-accuracy, high-output, low-cost performance of Farrel Roll Grinders.

FARREL

FARREL-BIRMINGHAM COMPANY, Inc.
ANSONIA, CONN.
New York • Buffalo • Pittsburgh • Akron • Chicago • Los Angeles

CARL-MAYER HI-SPEED TRADE MARK ROD BAKER

Far Ahead in comparative tests!



Large savings per pin in baking time.

Produces work of highest calibre.

Heavy Duty Construction.

Carl-Mayer Hi-Speed Rod Bakers have a more efficient heating and ventilating system . . . The patented Blow-Off feature removes moisture without rolling, bumping or agitating the coils . . . Write for complete details.

Illustration shows a Carl-Mayer Hi-Speed Rod Baker in a large Canadian steel plant.

OVER 20 YEARS EXPERIENCE

The CARL-MAYER Corp.
3030 Euclid Ave., CLEVELAND, OHIO.

Selecting A V-Drive Using Stock Belts

HOW to explain the problems of selecting a V-drive using stock belts in terms so understandable that a purchaser or operator without professional engineering training can comprehend them, and follow the problems step-by-step has long been a problem of V-belt manufacturers. In its new 24-page catalog section on fractional-horsepower V-belt design, The B. F. Goodrich Company, Akron, Ohio, has done just this, using five pages to outline all the factors.

✦ ✦ ✦

EXPLAINING that the problem is simply to select sheaves and a standard belt which will transmit power from a selected motor to a driven unit at required speed, the catalog section lists the following information to be known before a drive is selected: Type of machine and work to be done; RPM of driving shaft; RPM of driven shaft; name plate horsepower of motor or other prime mover and space limitations.

✦ ✦ ✦

NINE separate steps by which the selection of a V-belt drive may be made are then clearly explained, and with each step an example is given. These steps are: Select the large sheave; determine speed ratio; determine diameter of small sheave; determine center distance; determine design horsepower; select proper belt cross-section; check belt cross section; check selected drive, and choose belt length.

✦ ✦ ✦

FOLLOWING this exposition of the V-belt selection problem comes a discussion of V-belt practice, including such subjects as take up, slack off, tension, idlers, effect of oil, effects of fumes and gases, moisture, dust, and temperature, guards or shields, use of belt dressing, storage, riding position of belt, and installation.

CONVERSION of belt numbers and standard fractional horsepower V-belt pulley groove top widths are also given.

✦ ✦ ✦

ONE page is devoted to the subject of selecting a drive using non-standard belts, and selection of a V-flat drive, while an eight page supplement to the catalog section gives all the data on non-standard V-belts. Standard fractional, horsepower V-belts are discussed on one page, with data, including the approximate weight in pounds of each belt in three series.

✦ ✦ ✦

TWO pages are given to data on light duty sheaves for "A" and "B" section belts, and two pages to tables on service factors, recommended sheave diameters, correction factors, and recommended sheave groove angles.

✦ ✦ ✦

TWO pages are given to horsepower ratings of standard and non-standard V-belts, and ten to data on fractional horsepower stock drives, for various motor speeds, speed ratios and center distances. A simple method for figuring belt speeds is indicated.

✦ ✦ ✦

Group Policy

THE **W. A. Laidlaw Wire Company**, with headquarters at South Bartonville, Ill., has recently acquired a group policy involving $30,000.

✦ ✦ ✦

SIXTY employees are covered with life insurance of $500 each through the adoption of the policy issued by the Prudential Insurance Company of America.

✦ ✦ ✦

THE workers themselves will pay a part of the premium and the remainder of the expense will be assumed by the employing company, the policy having been issued on the contributory basis.

✦ ✦ ✦

Announcement of Removal

MASTER WIRE DIE CORPORATION announce their removal to new and larger headquarters at 250 East 43d Street, New York City, N. Y.

9 New Types of Elastic Stop Nuts Made Available

ELASTIC STOP NUT CORPORATION, 1015 Newark Avenue, Elizabeth, New Jersey, announces an expansion of its line through the introduction of nine new types of nuts all of which embody the basic Elastic Stop self-locking element, a resilient non-metallic collar which is built into the head of the nut.

✦ ✦ ✦

THIS collar, in resisting the entrance of the bolt or screw, forces the thread faces into a pressure-contact which is maintained after the nut is tightened. With thread play thus eliminated, the nut can not work loose under vibration, operating stresses, or wear of surrounding parts.

✦ ✦ ✦

THE new types of nuts are designated as thin hexagonal, spline, internal wrenching, countersunk and counterbored one-lug anchor, countersunk and counterbored two-lug anchor, countersunk corner anchor, bracket anchor, floating right-angle anchor, and floating basket anchor. With variations in sizes, thread systems and materials, 160 new standard items are offered.

✦ ✦ ✦

AN extensively illustrated catalog, containing complete listings and a graphic explanation of the Elastic Stop principle, will be sent upon request to the manufacturer.

STEEL WIRE

By MAURICE BONZEL

Translated and Published by
Kenneth B. Lewis
Consulting Engineer

Price $15.00

495 pages. 414 illustrations

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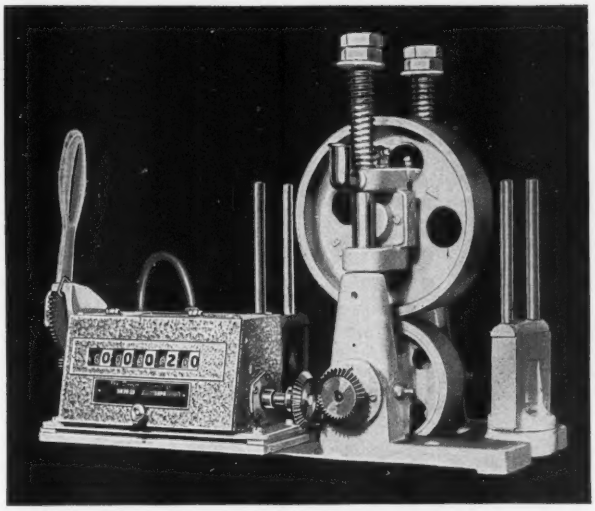

Now a

Wire Measuring Machine for Every Purpose

The recent addition of several new models enables us to offer wire and cable manufacturers and users, machines for the fast, accurate lineal measurement of any kind of bare and insulated wire, twisted pairs, wire rope and lead-covered or armored cable. Capacities .005" dia. and up.

Write for bulletin giving description and prices of Productimeter Wire Measuring Machines and Braiding Machine Counters.

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Milwaukee, Wisconsin

176 Eddy Street
Providence, Rhode Island

Cable Developments in the Electrical Industry During 1939

By Guy Bartlett
General Electric Company

A FACTORY process that greatly improves the quality of the lead sheath of cable was introduced during the year. In the past decade improvements in paper insulation, both of solid and oil-filled types, have been rapid and continuous, so that today such insulation is exceedingly uniform and reliable. As a result, the proportion of paper cable failures due to the insulation itself has been greatly reduced, and the proportion of such failures due to lead sheath trouble has increased correspondingly, even though such lead sheath failures actually have decreased.

✦ ✦ ✦

IN the new lead sheath process a three-compartment, electric lead melting pot, having automatic temperature control and recording and indicating temperature devices, is employed. The lead pigs are melted on shelf-type heaters, elevated from the bottom of the first compartment so that oxides and dross can rise easily to the surface. Molten lead flows from the bottom of this first compartment into the bottom of the second one, where it is kept under an atmosphere of inert gas to prevent oxidation. The third compartment is thermally isolated from the other two so that introduction of cold pigs of lead into the first will not affect the temperature of the lead in the third compartment, from which lead is drawn into the press. This compartment also has an atmosphere of inert gas.

✦ ✦ ✦

THE lead is admitted to the press cylinder through a pipe initially filled with inert gas. On the end of the pipe is a nozzle which takes a position close to the surface of the previous charge of solidified lead remaining in the cylinder. The molten lead, forced through the nozzle under pressure, thoroughly melts the surface of the solidified lead, releasing any

(*Please turn to Page 128*)

WAYNE WIRE DIE CO., Inc.

Announces the removal of its

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ONE HUNDRED THIRTY-THREE MOUNTAIN ROAD

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These machines are made in eleven different sizes. This enables us to cover any size of nail most efficiently.

GLADER Nail making machines have been adopted as standard equipment in all recent major nail mill installations.

For further information, prices, etc., write to us.

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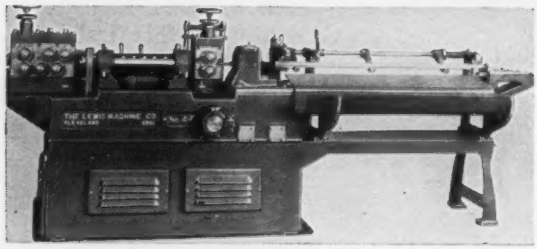

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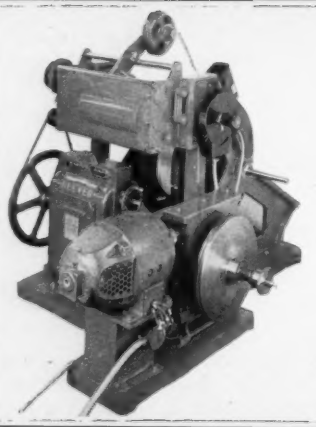

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INDIVIDUAL MOTOR DRIVEN 30" REEL STAND

Adjustable for width of reel and rate of traverse.

Traverse guide adjustable for width of wire being insulated and variable tension take up provided.

EST. 1855 AIMco INC. 1913

"American" AIMco INSULATING MACHINERY COMPANY

517 West Huntingdon St.

PHILADELPHIA PENNSYLVANIA U.S.A.

Cable Developments During 1939

(*Continued from Page 127*)

lead oxides which rise to the top of the cylinder, insuring a perfect union of the two charges. It also melts the lead shim on the wall of lead cylinder. The nozzle imparts a swirling action to the lead so that any oxides or impurities which may be present are drawn to the center of the surface of the new molten charge of lead and are easily skimmed off.

✦ ✦ ✦

AN atmosphere of burning hydrogen around the top of the lead cylinder prevents air from coming in contact with the lead when the ram is withdrawn from the cylinder, further insuring that the lead as it goes on the cable is clean and free from dross and oxides. A new die block having large passages for flow of the plastic lead assures more uniform thickness of the sheath.

✦ ✦ ✦

Varnished Cambric Insulation

HEAVIER loads may be used, higher voltages withstood, and more severe operating conditions met with a new varnished cambric for cable insulation. Similar in appearance to the black cloth previously used, the new high-temperature varnished cloth permits cable to be operated at a maximum copper temperature approximately 10 C higher than the old cloth. It also has lower dielectric losses, and is as good or better in all other respects than the old type of cloth.

✦ ✦ ✦

Rubber Cable

THINWOL cable insulation was improved with respect to long life, high dielectric strength, low dielectric constant, high insulation resistance, and low moisture absorption. Use of such insulation for low-voltage work results in a considerable saving in size and weight, and frequently is an important saving in cost of control and communication cables, where many conductors must be installed in a single lead sheath or other type of covering.

✦ ✦ ✦

Synthetic Insulation

A PROCESS was developed for the extrusion of the synthetic

insulation as used on Flamenol wire on to relatively large conductors; previously use of the material was limited to the smaller sizes. The advantages of the new insulation have thus been realized on circuits of larger power and current-carrying capacity. The insulation also has found wide application as a cable finish in locations where rubber would be damaged by material such as oil and where rubber without this highly resistant finish would be impractical.

✦ ✦ ✦

Cable Accessories

A NEW type of press for use with multi-conductor cables, the yoke type was developed for the hydraulic pressed connector announced a year ago. The new yoke type press is small in size, light in weight, and easily applied in difficult situations.

✦ ✦ ✦

COMBINED as a single unit for the first time, capacitance taps and current transformers in 138-kv terminals were made for the 115-kv oil-filled cable circuit installed by the Narragansett Electric Company.

✦ ✦ ✦

A MOLDED-TYPE cone insulator for stop-joints, newly developed, is considered superior to previous types for certain applications, increasing the strength and reliability of the stop-joint materially.

✦ ✦ ✦

Data Book on Electric Heating and Corrosion-Resisting Alloys

THE above booklet contains complete information on the various corrosion-resisting alloys manufactured by this company together with their application in the manufacture of wire and wire products, complete temperature resisting charts and tables are shown throughout the book, heating element data is supplied and details on alloys for special application such as radio, seamless tubing, etc., given in very great detail. Copies of the booklet may be obtained by addressing the Driver-Harris Company, Harrison, New Jersey.

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FINEST **Raw Material** reduced to sharp cutting fragments under controlled conditions.

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Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

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LAWRENCE, MASSACHUSETTS

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Tell us what kind of metal you pickle, the acid used and its concentration, and the temperature of the bath. We will suggest the proper RODINE for your use.

Bulletin on request.

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GET COMPLETE LUBRICATION WITH NOPCO 2261

Nopco 2261 is a new departure in tube drawing compounds. Its extremely high neutral fat content—50%, insures correct and adequate lubrication, even in cases where heavy draws with large reductions are made.

Nopco 2261 is highly versatile, being equally effective in the wet drawing of:

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Write for Technical Data Bulletin, or better still, order enough for a trial—see for yourself.

REG. U. S. NOPCO PAT. OFF.

NATIONAL OIL PRODUCTS CO.

HARRISON, N. J.

BOSTON • CEDARTOWN, GA. • CHICAGO • SAN FRANCISCO

A Brief Resume of Special Cold Heading Wire Requirements

(*Continued from Page 102*)

Conclusion

THIS brief treatise on cold heading stock has covered only a very limited number of applications for which such stock is required. However, our purpose was primarily to point out those applications which require special quality considerations and to convey some idea of the extent to which technical effort is being applied to meet the challenge of the heading industry. It is also hoped there may be a little greater realization of the difficulties in meeting the demands where higher speeds, more rigid specifications, and all purpose requirements appear to be rapidly replacing the requirements of yesterday.

✦ ✦ ✦

New Catalog Describes Farrel Gearflex Couplings

PLANT executives and engineers interested in the most efficient means of guarding against the effects of misalignment of connected machine shafts will find valuable information in a new illustrated catalog of Farrel Gearflex Couplings just issued by Farrel-Birmingham Company, Inc., 344 Vulcan Street, Buffalo, N. Y.

✦ ✦ ✦

THIS catalog, No. 443, explains the function of a flexible coupling and describes how Farrel Gearflex Couplings compensate for parallel or angular misalignment or a combination of both, illustrating the details of design and construction with a number of fine halftone plates. It gives the applications, ratings, dimensions and weights of the various types of flexible couplings manufactured by Farrel-Birmingham Company, illustrated with numerous charts and diagrams. Photographs of a number of coupling installations are also contained in this catalog and full information is given on such subjects as service factors and their use in making a selection of a flexible coupling for any particular application, as well as information necessary in ordering, and other data.

STEEL WIRE

By MAURICE BONZEL

✦ ✦ ✦

Translated and Published by

Kenneth B. Lewis

Consulting Engineer

✦ ✦ ✦

Price $15.00

✦ ✦ ✦

495 pages. 414 illustrations

✦ ✦ ✦

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Rayotube Detectors

TO show some of the specialized temperature measuring problems to which Rayotube detectors are now being applied, Leeds and Northrup Company has just issued a 40-page catalog . . . "Micromax and Speedomax Rayotube Pyrometers".

✦ ✦ ✦

IT pictures Rayotubes in a variety of applications detecting temperatures of work in motion . . . rod-stock during hot-rolling; work passing through continuous heat-treat furnaces; rails on the rolls. It shows Rayotubes sighting directly on many important surfaces . . . on the under-side of open-hearth roofs; on the lining of rotary kilns; on the retort of spiral-retort furnaces. It shows Rayotubes mounted at forge-furnaces; at continuous ceramic kilns; at beehive kilns; at soaking pits; at open-hearth checker-chambers, etc.

✦ ✦ ✦

DIAGRAMS show the various methods of applying these detectors . . . and actual-size color reproductions of chart-records illustrate the features of Micromax and Speedomax instruments which Rayotubes now make available to many new applications.

✦ ✦ ✦

A COPY of this publication will be sent promptly to anyone interested. Write to Leeds and Northrup Company, 4934 Stenton Avenue, Philadelphia, Pa. Ask for Catalog N-33B.

MORRISON FLASH BAKER
20 Installations to Date
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2—Baird No. 3 & S3F 4 Slide Wire Machines
7—Waterbury Step Cone Wire Drawing Machines
1—Two Spindle Bull Block Motor Driven
6—Lewis Welding Wire S & C Machines M. D.
2—Shuster Shaped Wire S & C Machines ½" & ⅜"
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Wire Mill and Cold Rolling Equipment
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For Rectangular and Special Shaped Wire
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Outstanding Personalities of the Wire Industry

(*Continued from Page 115*)

Douglas F. G. Eliot

DOUGLAS F. G. ELIOT, general commercial manager of Western Electric for the past three years, was appointed general purchasing agent, effective December 11.

✦ ✦ ✦

IN this capacity he takes charge of Western Electric's purchasing department which carries on a $75,000,000-a-year buying job for the Bell System.

✦ ✦ ✦

MR. ELIOT, a Yale graduate of 1909, has been connected with Western Electric since 1911 when he began as a clerk at its New York distributing house. He became a buyer in 1915 and later spent a year and a half at Tokyo with the Nippon Electric Company, then a Western Electric subsidiary.

✦ ✦ ✦

FOLLOWING a period of Army service during the World War, Mr. Eliot re-entered business as a buyer with the International Western Electric Company. In 1922 he returned to Tokyo as comptroller of the Nippon Electric Company, also serving as auditor of Sumitomo Electric Wire and Cable Works.

✦ ✦ ✦

HE went to London for a short time in 1926 as European commercial manager for Western Electric, and became a purchasing agent at New York headquarters the same year. He was personnel director of the company from 1929 until his appointment as general commercial manager in 1937.

✦ ✦ ✦

Clarence G. Stoll

CLARENCE G. STOLL was elected president of the Western Electric Company at a meeting of the Company's directors, Tuesday, December 12, succeeding **Edgar S. Bloom**, who retired on December 31.

✦ ✦ ✦

MR. STOLL has been vice president in charge of operations since 1928. He has spent his entire business career of 36 years with Western Electric, having risen from student apprentice to become now its chief executive.

ROYLE
PATERSON N J
BUILDING EXTRUDERS SINCE 1880
Pioneer builders of tubing and rubber covering machinery
JOHN ROYLE & SONS
PATERSON, N. J.
British Agency: James Day (Machinery) Ltd., Sentinel House, Southampton Row, London, W. C. 1, England

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Also Slit Kraft
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WIRE BRAIDING — SPOOLING — TAPING
WINDING AND SPECIAL MACHINES
SINFRA WIRE COVERING MACHINES
FIDELITY MACHINE CO.
3908-18 Frankford Ave., Phila., Pa.

JLE AUTOMATIC COILING EQUIPMENT JLE
276,000 feet of CODE WIRE per day (8 hours) per Operator in 500 foot coils with two ties.
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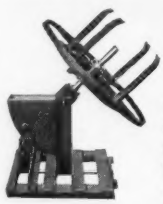
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THE ANNUAL MEDAL AWARD

OF THE

WIRE ASSOCIATION

FOR THE MOST MERITORIOUS PAPER ON
WIRE MANUFACTURE OR FABRICATION DURING THE YEAR

ALL members of the Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association Meeting at Cleveland, October 21-25, 1940.

✦ ✦ ✦

FOR 1940 and subsequent years a medal will be awarded in each of the two major divisions of the activities of the Association, to the papers coming nearest to the requirement set forth above.

✦ ✦ ✦

CONSIDERATION for the Medal Awards is not limited to the papers presented at the Annual Meeting, but is given to all papers submitted by members and published in "WIRE & WIRE PRODUCTS" during the year.

✦ ✦ ✦

SELECTION of papers to be presented at the Annual Convention rests in the hands of the Joint Programme Committee of the Wire Association.

✦ ✦ ✦

ALL papers submitted become the property of the Wire Association, and the Board of Directors constitutes the Committee on Awards.

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ADDITIONAL information may be obtained by addressing:

RICHARD E. BROWN,
SECRETARY, THE WIRE ASSOCIATION
STAMFORD TRUST CO. BLDG., STAMFORD, CONNECTICUT

WHERE TO BUY

For more complete information, consult the annual Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

AIR DRAW FURNACES—
Carl-Mayer Corp., The,. Cleveland, Ohio.

ANNEALING POTS AND BOXES—
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

ANTI-RUST—Compound
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

AUTOMATIC SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

BAKERS—Flash
Morrison Engineering Corp., Cleveland, O.

BAKERS—Hi-Speed
Carl-Mayer Corp., The,. Cleveland, Ohio.

BAKERS—Rod and Wire
Carl-Mayer Corp., The,. Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Corp., Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.

BOBBINS—Braider and Wire Weaving
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BORTZ—Diamond
Smit, J. K. & Sons, Inc., New York, N. Y.

CARRIERS—Braider, High Speed
Mossberg Pressed Steel Corp., Attleboro, Mass.

CEMENT FLOOR CLEANER—
Magnus Chemical Co., Garwood, N. J.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.

CLEANERS—Hand and Metal
Magnus Chemical Co., Garwood, N. J.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Hauser-Standard Tank Co., Cincinnati, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CLOTH TESTERS—
Scott, Henry L., Co., Providence, R. I.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.
National Oil Products Co., Harrison, N. J.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

COILERS AND SPOOLERS FOR INSULATED WIRES—
Entwistle, James L., Pawtucket, R. I.

COPHOLDERS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUSTOM ROD ROLLING—
Wilbur B. Driver Co., Newark, N. J.

CUSTOM WIRE DRAWING—
Hy-Carbo Steel Co., Lowell, Mass.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIAMOND POWDERS—
Rusch Wire Die Corp., New York, N. Y.
Smit, J. K. & Sons, Inc., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIES—Diamond
Cochaud Wire Die Co., New York, N. Y.
Globe Wire Die Co. (M. V. Dreyspool), New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Inc., Irvington, N. J.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Co., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Inc., Irvington, N. J.

DIES—Rod and Tube Drawing
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Globe Wire Die Co. (M. V. Dreyspool), New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

DIES—Tungsten Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Globe Wire Die Co. (M. V. Dreyspool), New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

DRAW BENCHES—
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Entwistle, James L., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FILLERS—Paper for Cable
E. W. Twitchell, Inc., Phila., Pa.

FLASH BAKERS—
Morrison Engineering Corp., Cleveland, O.

FURNACES—Annealing
Carl-Mayer Corp., The,. Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The,. Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Hardening and Tempering
Carl-Mayer Corp., The,. Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
John Robertson Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Carl-Mayer Corp., The,. Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Salt Bath
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The,. Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

GEARS—Wire Mill
Farrel-Birmingham Co., Ansonia, Conn.

GRINDERS—Roll
Farrel-Birmingham Co., Ansonia, Conn.
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The,. Cleveland, Ohio.

HOISTS—Electric Travelling
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

HOT ROLLED RODS—
Driver Co., Wilbur B., Newark, N. J.

INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
National Oil Products Co., Harrison, N. J.

INSTRUMENTS—Electrical
Entwistle, James L., Pawtucket, R. I.

INSULATION — Cable or Cable Filler
E. W. Twitchell, Inc., Phila., Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.
Vanco, Co., The, Manchester, Conn.

LUBRICANTS—Wire Drawing
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.
Vanco, Co., The, Manchester, Conn.

MACHINERY — Armoring (Cable, Wire Hose)
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

WHERE TO BUY, Continued

MACHINERY—Coilers
Broden Construction Co., Cleveland, O.
Entwistle, James L., Pawtucket, R. I.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Farrel-Birmingham Co., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Covering Wire
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.

MACHINERY—Enameling
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Royle, John & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
H. J. Ruesch Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works Co., Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine, Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
Farrel-Birmingham Co., Ansonia, Conn.
National Rubber Machinery Co., Akron, O.
Royle, John & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Ansonia, Conn.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
Farrel-Birmingham Co., Ansonia, Conn.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Stranding
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine, Rahway, N. J.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Entwistle, James L., Pawtucket, R. I.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Testing—Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Inc., Newark, N. J.
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Wire Tinning
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OVENS—Industrial
Carl-Mayer Corp., Cleveland, Ohio.
Morrison Engineering Corp., Cleveland, O.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
National Oil Products Co., Harrison, N. J.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I.

PRESSES—Lead
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

RECORDERS—Fault and Reel
Entwistle, James L., Pawtucket, R. I.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery, Inc., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster Co., F. B., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Takeoff
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster Co., F. B., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster Co., F. B., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Morrison Engineering Corp., Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.

RODS—Hot Rolled to Order
Wilbur B. Driver Co., Newark, N. J.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

ROLL STRAIGHTENERS—
Moslo Machinery, Inc., Cleveland, O.

ROLLS—
Farrel-Birmingham Co., Ansonia, Conn.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUND—
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SKIN PROTECTOR—
Magnus Chemical Co., Garwood, N. J.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.
Vanco, Co., The, Manchester, Conn.

SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

SPOOLS—Annealing and Wire Drawing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Chicago, Ill.

SPOOLS—Shipping and Shop
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Corp., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Mossberg Pressed Steel Corp., Attleboro, Mass.

TAKE-UPS FOR CABLE, HOSE, LEAD PRESSES AND SHEET RUBBER—
Entwistle, James L., Pawtucket, R. I.

TANKS—Acid
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Lead Lined
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Pickling
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Rubber Lined
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANKS—Wooden
Hauser-Stander Tank Co., Cincinnati, O.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Entwistle, James L., Providence, R. I.
Scott Co., Henry L., Providence, R. I.

TRAMRAIL SYSTEMS—
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
H. J. Ruesch Machine Co., Newark, N. J.

TURKS HEAD—
Standard Machinery Co., Auburn, R. I.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y. Co., Phila., Pa.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE DRAWING—High Grade Custom
Hy-Carbo Steel Co., Lowell, Mass.

WIRE—Electric
Driver Co., Wilbur B., Newark, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Resistance
Driver Co., Wilbur B., Newark, N. J.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Stainless Steel—
Driver Co., Wilbur B., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE AND RIBBON—Special Alloy
Driver Co., Wilbur B., Newark, N. J.

WIRE AND RIBBON—Monel
Driver Co., Wilbur B., Newark, N. J.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

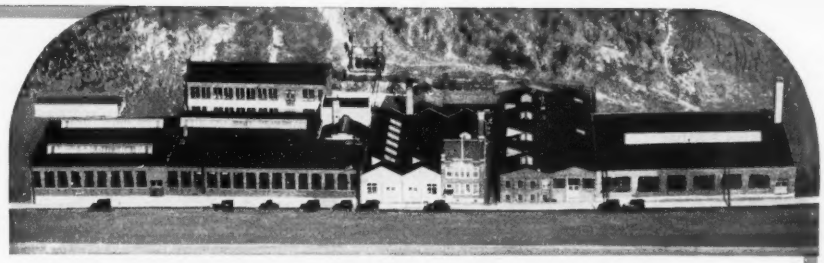
WIRE, WEAVING—Non Ferrous
Driver Co., Wilbur B., Newark, N. J.
Hudson Wire Co., Ossining, N. Y.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

HUDCO

SPECIALIZES

WINCO



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High Brass, Low Brass, Zinc 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper.

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Pure Lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire, High Conductivity, Electric Wire.

Cadmium, Nickel Silver, (10%, 18%, 30%); Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze.

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